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INSTALLATION RESTORATION PROGRAM

PHASE I - RECORDS SEARCH

POPE AFB, NORTH CAROLINA

PREPARED FOR

UNITED STATES AIR FORCE
AFESC/DEV
Tyndall AFB, Florida
and
HQ MAC/DEEV
Scott AFB, Illinois

MAY 1985

ES ENGINEERING-SCIENCE

NOTICE

This report has been prepared for the United States Air Force by Engineering-Science for the purpose of aiding in the Air Force Installation Restoration Program. It is not an endorsement of any product. The views expressed herein are those of the contractor and do not necessarily reflect the official views of the publishing agency, the United States Air Force, nor the Department of Defense.

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INSTALLATION RESTORATION PROGRAM
PHASE I: RECORDS SEARCH
POPE AFB
NORTH CAROLINA

Prepared For

United States Air Force
AFESC/DEV
Tyndall AFB, Florida
and
HQ MAC/DEEV
Scott AFB, Illinois

May 1985

Prepared By

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TABLE OF CONTENTS

TABLE OF CONTENTS
(Continued)

TABLE OF CONTENTS
(Continued)

LIST OF FIGURES

LIST OF FIGURES (Continued)

LIST OF TABLES

LIST OF TABLES
(Continued)

EXECUTIVE SUMMARY

The Department of Defense (DOD) has developed a program to identify and evaluate past hazardous material disposal sites on DOD property, to control the migration of hazardous contaminants, and to control hazards to health or welfare that may result from these past disposal operations. This program is called the Installation Restoration Program (IRP). The IRP has four phases consisting of Phase I, Installation Assessment/Records Search; Phase II, Confirmation/Quantification; Phase III, Technology Base Development; and Phase IV, Operations/Remedial Actions. Engineering-Science (ES) was retained by the United States Air Force to conduct the Phase I, Initial Assessment/Records Search for Pope Air Force Base (AFB) under Contract No. F08637 84 C0070.

INSTALLATION DESCRIPTION

Pope AFB is located approximately ten miles northwest of Fayetteville, North Carolina in Cumberland County. The base consists of 1,832 acres, most of which is within the Fort Bragg Military Reservation.

Pope AFB was established in 1919. Flying activities have existed at the base since the beginning. The base became most active during and following World War II. Its mission has predominately emphasized airlift training and tactics required to deploy personnel and equipment throughout the world.

ENVIRONMENTAL SETTING

The environmental setting data reviewed for this investigation identified the following points relevant to Pope AFB:

- o The mean annual precipitation for the base is 46.9 inches. the net annual precipitation is calculated to be 4.9 inches, which suggests a moderate infiltration potential. The one year 24-hour rainfall value for the study area is 3.2 inches, which indicates a moderate to high potential for erosion.

- Substantial localized flooding may occur on base as the result of a 100-year storm event.
- Surficial unconsolidated deposits exist for the upper twenty to thirty feet of the installation land surface. These materials have been associated with the Upper Sandy Aquifer in the region. Ground water is present in these materials at shallow depths (six feet or less). Most of the installation is located within the recharge zone of this unit. Discharge from this unit may be directed to local surface waters or to other communicating aquifers. There is no known use of water from this aquifer.
- The region's principal aquifer, the Lower Sandy Aquifer, directly underlies the Upper Sandy Aquifer. The lower unit probably receives recharge from the upper aquifer. The base is located in the recharge zone of this major source of water supply. Spring Lake and adjacent mobile home parks obtain their respective water supplies from the Lower Sandy Aquifer.
- A Bedrock Aquifer underlies the Lower Sandy Aquifer. It is utilized as a source of water by one consumer near the base. Its relationship to overlying units is uncertain and it is assumed that recharge is directed from the overlying unconsolidated aquifers to the bedrock.
- Pope AFB obtains its water supplies from Fort Bragg which utilizes the Little River (just upstream of drainage ditches from the base). Fort Bragg also provides sewage treatment services for the base.
- Some periodic base surface water quality problems have been identified.
- No wetlands have been identified on base.
- No threatened or endangered plant species have been observed on Pope AFB; however, the endangered Red-Cockaded Woodpecker resides in a portion of the base.

METHODOLOGY

During the course of this project, interviews were conducted with installation personnel (past and present) familiar with past waste disposal practices; file searches were performed for past hazardous waste activities; interviews were held with local, state and federal agencies; and field surveys were conducted at suspected past hazardous waste activity sites. Six sites (Figure 1) were initially identified as potentially containing hazardous contaminants and having the potential for contaminant migration resulting from past activities. These sites have been assessed using a Hazard Assessment Rating Methodology (HARM) which takes into account factors such as site characteristics, waste characteristics, potential for contaminant migration and waste management practices. The details of the rating procedure are presented in Appendix G and the results of the assessment are given in Table 1. The rating system is a resource management tool and is designed to indicate the relative need for follow-up investigation.

FINDINGS AND CONCLUSIONS

The following conclusions have been developed based on the results of the project team field inspection, reviews of base records and files, interviews with base personnel, and evaluations using the HARM system.

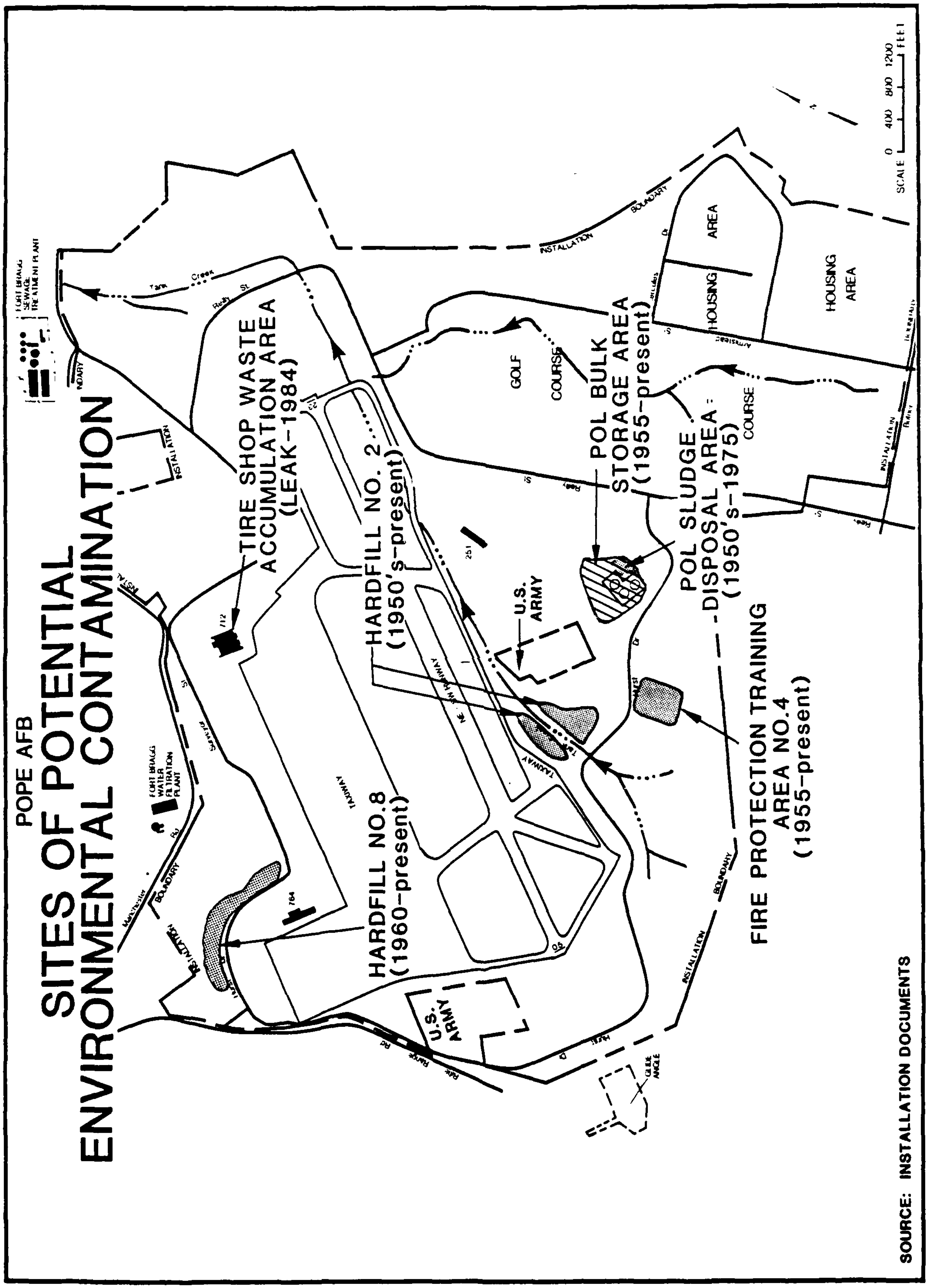
The areas found to have sufficient potential to create environmental contamination are as follows:

- Fire Protection Training Area No. 4
- POL Bulk Storage Area
- Tire Shop Waste Accumulation Area
- POL Sludge Disposal Area
- Hardfill No. 2
- Hardfill No. 8

RECOMMENDATIONS

Recommended guidelines for future land use restrictions at the disposal sites are presented in Section 6. A program for proceeding with Phase II and other IRP activities at Pope AFB is also presented in Section 6. The recommended actions include a soil boring, monitoring well, sampling and analysis program to determine if contamination

FIGURE 1



POPE AFB
SITES OF POTENTIAL ENVIRONMENTAL CONTAMINATION

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TABLE 1
SITES EVALUATED USING THE
HAZARD ASSESSMENT RATING METHODOLOGY
POPE AFB

Rank	Site	Operation Period	HARM Score(1)
1	Fire Protection Training Area No. 4	1955 - Present	74
2	POL Bulk Storage Area	1950's-Present	71
3	Tire Shop Waste Accumulation Area	1975 - Present	70
4	POL Sludge Disposal Area	1950's-1975	60
5	Hardfill No. 2	1950's-Present	58
6	Hardfill No. 8	1960 - Present	54

(1) This ranking was performed according to the Hazard Assessment Rating Methodology (HARM) described in Appendix G. Individual rating forms are in Appendix H.

exists. This program may be expanded to define the extent and type of contamination if the initial step reveals contamination. The Phase II recommendations are summarized in Table 2.

TABLE 2
RECOMMENDED MONITORING PROGRAM FOR PHASE II IRP
AT POPE AFB

Site (Rating Score)	Recommended Monitoring Program
Fire Protection Training Area No. 4 (74)	Perform a geophysical survey to define potential contamination plumes. Take three soil borings (including one control), 10 feet deep or to the water table if it is less than 10 feet deep. Sample surface discharge leachate at appropriate locations. Install and sample one upgradient and five down-gradient wells. Construct wells with Schedule 40 PVC and screen 5-10 feet into the uppermost aquifer. Analyze the samples for the parameters in list A, Table 6.2 Tentative sampling and well locations are shown in Figure 6.1.
POL Bulk Storage Area (71)	Sample surface water upstream (control) and four points downstream. One of the downstream sampling points should be at the location where past sampling has taken place. Sampling and tentative well locations are shown in Figure 6.2. Take soil borings in seepage area and the diked areas 10 feet deep or to the water table if it is less than 10 feet. Perform a geophysical survey to define potential contamination plumes. Install seven monitoring wells with one located upgradient of the site to act as a control. Construct wells with Schedule 40 PVC and screen 5-10 feet into the uppermost aquifer. Analyze the samples for the parameters in List A, Table 6.2.
Tire Shop Waste Accumulation Area (70)	Take three soil borings (one control) 10 feet deep or to the water table if it is less than 10 feet. Analyze the soil every 2 feet for the parameters in List A, Table 6.2.

TABLE 2
(Continued)
RECOMMENDED MONITORING PROGRAM FOR PHASE II IRP
AT POPE AFB

Site (Rating Score)	Recommended Monitoring Program
POL Sludge Disposal Area (60)	Take two soil borings (one control) 10 feet deep or to the water table if it is less than 10 feet. Analyze the soil every 2 feet for the parameters in List A, Table 6.2.
Hardfill No. 2 (58)	Take two or three water and sediment samples in the stream during dry weather. Take one control sample beyond the FPTA No. 4. Analyze the samples for the paramters in List B, Table 6.2.
Hardfill No. 8 (54)	Perform a geophysical survey to define potential contamination plumes. Install one upgradient well and four downgradient wells. Construct wells with Schedule 40 PVC and screen 5-10 feet into the uppermost aquifer. Analyze the ground water samples for the parameters in List A, Table 6.2.

Source: Engineering-Science

SECTION 1

INTRODUCTION

BACKGROUND AND AUTHORITY

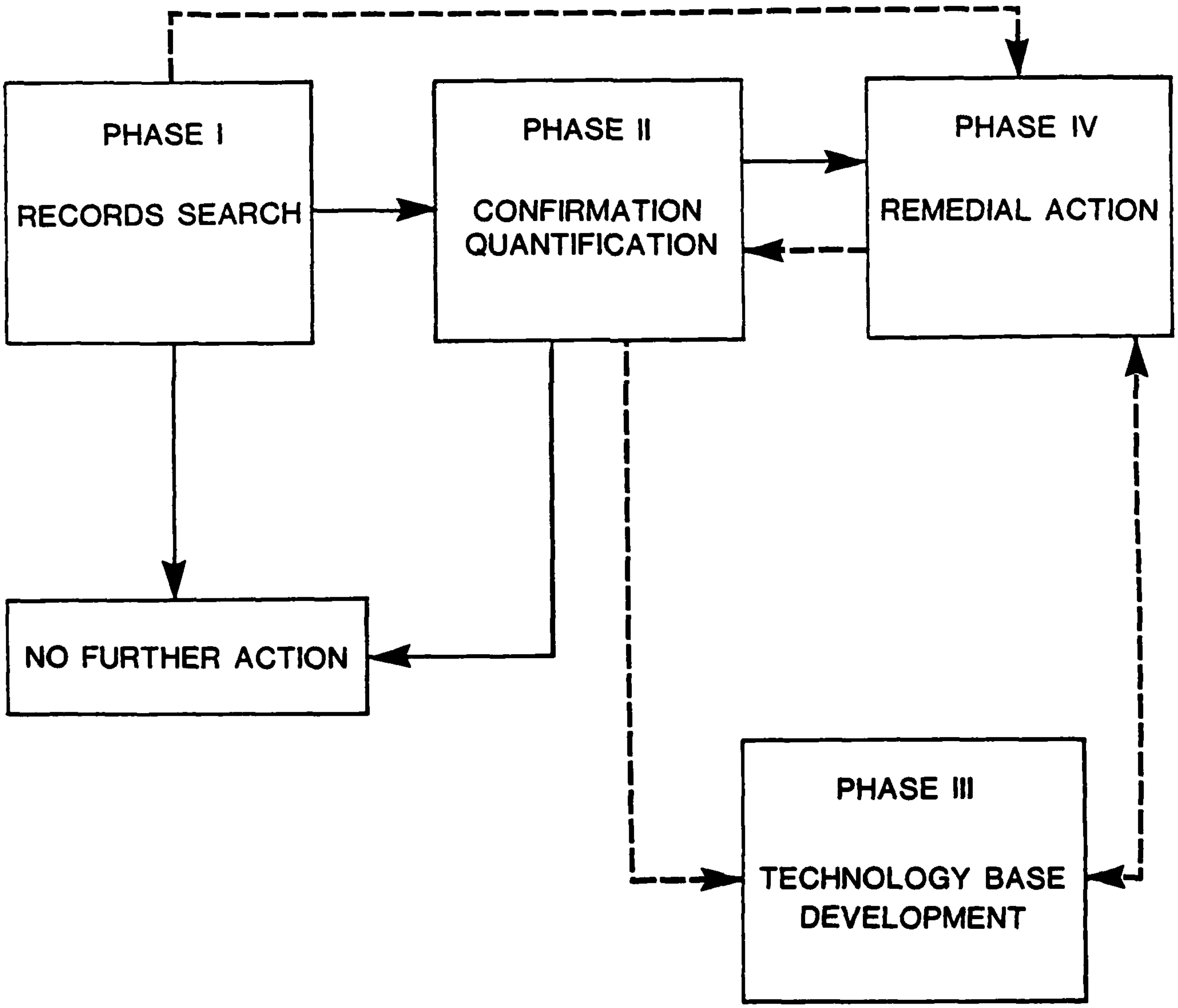
The United States Air Force, due to its primary mission of defense of the United States, has long been engaged in a wide variety of operations dealing with toxic and hazardous materials. Federal, state, and local governments have developed strict regulations to require that disposers identify the locations and contents of past disposal sites and take action to eliminate hazards in an environmentally responsible manner. The primary Federal legislation governing disposal of hazardous waste is the Resource Conservation and Recovery Act (RCRA) of 1976, as amended. Under Section 6003 of the Act, Federal agencies are directed to assist the Environmental Protection Agency (EPA) and under Section 3012, state agencies are required to inventory past disposal sites, and Federal agencies are required to make the information available to the requesting agencies. To assure compliance with these hazardous waste regulations, the Department of Defense (DOD) developed the Installation Restoration Program (IRP). The current DOD IRP policy is contained in Defense Environmental Quality Program Policy Memorandum (DEQPPM) 81-5, dated 11 December 1981 and implemented by Air Force message dated 21 January 1982. DEQPPM 81-5 reissued and amplified all previous directives and memoranda on the Installation Restoration Program. DOD policy is to identify and fully evaluate suspected problems associated with past hazardous contamination, and to control hazards to health and welfare that resulted from these past operations. The IRP is the basis for response actions on Air Force installations under the provisions of the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) of 1980, clarified by Executive Order 12316. CERCLA is the primary legislation governing remedial action at past hazardous waste disposal sites.

PURPOSE AND SCOPE

The Installation Restoration Program is a four-phased program (Figure 1.1) designed to assure that identification, confirmation/quantification, and remedial actions are performed in a timely and cost-effective manner. Each phase is briefly described below:

- <u>Phase I - Installation Assessment/Records Search</u> - Phase I is to identify and prioritize those past disposal sites that may pose a hazard to public health or the environment as a result of contaminant migration to surface or ground waters, or have an adverse effect by its persistence in the environment. In this phase, it is determined whether a site requires further action to confirm an environmental hazard or whether it may be considered to present no hazard at this time. If a site requires immediate remedial action, such as removal of abandoned drums, the action can proceed directly to Phase IV. Phase I is a basic background document for the Phase II study.
- <u>Phase II - Confirmation/Quantification</u> - Phase II is to define and quantify, by preliminary and comprehensive environmental and/or ecological survey, the presence or absence of contamination, the extent of contamination, waste characterization (when required by the regulatory agency), and to identify sites or locations where remedial action is required in Phase IV. Research requirements identified during this phase will be included in the Phase III effort of the program.
- <u>Phase III - Technology Base Development</u> - Phase III is to develop a sound data base upon which to prepare a comprehensive remedial action plan. This phase includes implementation of research requirements and technology for objective assessment of adverse effects. A Phase III requirement can be identified at any time during the program or may not be needed at all.
- <u>Phase IV - Operations/Remedial Actions</u> - Phase IV includes the preparation and implementation of the remedial action plan.

U.S. AIR FORCE INSTALLATION RESTORATION PROGRAM



SOURCE: AFESC

Engineering-Science (ES) was retained by the United States Air Force to conduct the Phase I Records Search at Pope AFB under Contract No. F08637 84 C0070. This report contains a summary and an evaluation of the information collected during Phase I of the IRP and recommended follow-on actions. The land area included as part of the Pope AFB study is 1,832 acres.

The activities performed as a part of the Phase I study scope included the following:

- Review of site records
- Interviews with personnel familiar with past generation and disposal activities
- Survey of types and quantities of wastes generated
- Determination of current and past hazardous waste treatment, storage, and disposal activities
- Description of the environmental setting at the base
- Review of past disposal practices and methods
- Reconnaissance of field conditions
- Collection of pertinent information from federal, state and local agencies
- Assessment of the potential for contaminant migration
- Development of recommendations for follow-on actions

ES performed the on-site portion of the records search during January 1985. The following team of professionals were involved:

- R.L. Thoem, Environmental Engineer and Project Manager, M.S., Sanitary Engineering, 21 years of professional experience.

- J.R. Absalon, Hydrogeologist, B.S., Geology, 10 years of professional experience.

- T.R. Harper, Environmental Scientist, B.S., Chemistry and Microbiology, 2 years of professional experience.

More detailed information on these three individuals is presented in Appendix A.

METHODOLOGY

The methodology utilized in the Pope AFB Records Search began with a review of past and present industrial operations conducted at the installation. Information was obtained from available records such as shop files and real property files, as well as interviews with 57 past and present base employees from various operating areas. Those interviewed included current and past personnel associated with civil engineering, fuels management, roads and grounds maintenance, fire protection, real property, history, entomology, bioenvironmental engineering, field maintenance, avionics maintenance, and organizational maintenance. A listing of interviewee positions with approximate years of service is presented in Appendix B.

Concurrent with the employee interviews, the applicable federal, state and local agencies were contacted for pertinent study area related environmental data. The agencies contacted are listed below and in Appendix B.

- North Carolina Division of Environmental Management (Fayetteville and Raleigh, NC)
- U.S. Geological Survey; Water Resources Division (Raleigh, NC)
- U.S. Department of Agriculture, Soil Conservation Service (Fayetteville, NC)
- U.S. Environmental Protection Agency (Atlanta, GA)
- Office of Air Force History (Washington, DC)
- Washington National Record Center (Suitland, MD)
- National Archives (Washington, DC and Alexandria, VA)

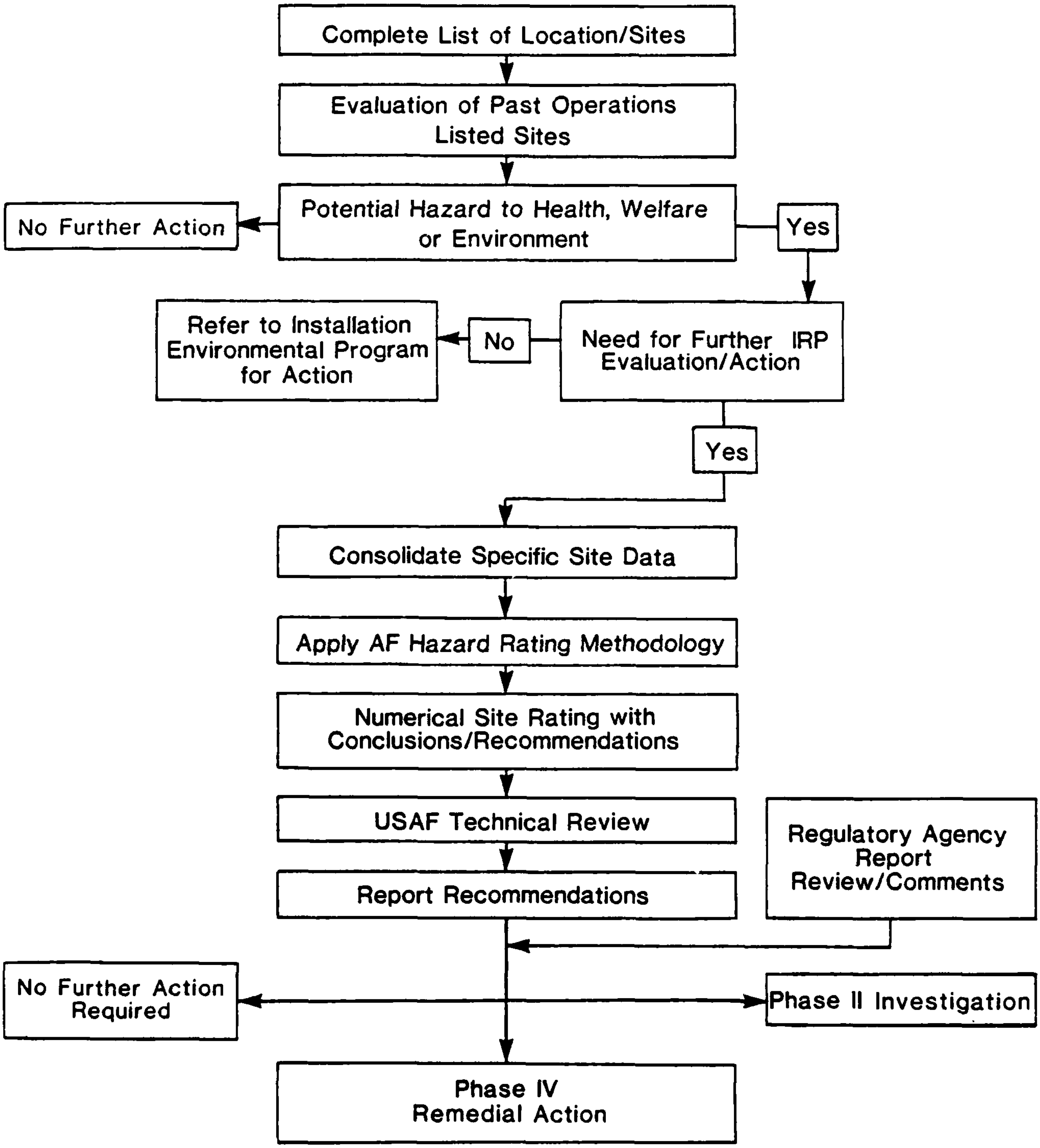
The next step in the activity review was to identify all sources of hazardous waste generation and to determine the past management practices regarding the use, storage, treatment, and disposal of hazardous materials from the various sources on the base. Included in this part of the activities review was the identification of all known past disposal sites and other possible sources of contamination such as spill areas.

A general ground tour and an overflight of the identified sites were made by the ES Project Team to gather site-specific information including: (1) general observations of existing site conditions; (2) visual evidence of environmental stress; (3) presence of nearby drainage ditches or surface waters; and (4) visual inspection of these water bodies for any obvious signs of contamination or leachate migration.

A decision was then made, based on all of the above information, whether a potential hazard to health, welfare or the environment exists at any of the identified sites using the Flow Chart shown in Figure 1.2. If no potential existed, the site received no further action. For those sites where a potential hazard was identified, a determination of the need for IRP evaluation/action was made by considering site-specific conditions. If no further IRP evaluation was determined necessary, then the site was referred to the installation environmental program for appropriate action. If a site warranted further investigation, it was evaluated and rated using the Hazard Assessment Rating Methodology (HARM). The HARM score is a resource management tool which indicates the relative potential for adverse effects on health or the environment at each site evaluated.

PHASE I INSTALLATION RESTORATION PROGRAM

RECORDS SEARCH FLOW CHART



Source: AFESC

SECTION 2

INSTALLATION DESCRIPTION

LOCATION, SIZE AND BOUNDARIES

Pope AFB is located approximately ten miles northwest of Fayetteville, North Carolina in Cumberland County. Most of the base is within the Fort Bragg Military Reservation. The base is bordered on the west, north and south sides by Fort Bragg and on the east by residential and undeveloped land. Figures 2.1 and 2.2 show the location of the base both regionally and within the Fayetteville area.

The base has a land area of 1,832 acres. The Army provides 1,706 acres by permit. The remaining 126 acres are owned by the Air Force. Forty-nine acres in the northeast part of the base were just purchased in 1984. All Pope AFB property is included within the installation boundary except a seven-acre clear zone site off the west end of the runway and a two-acre site which adjoins the base at the Reilly Street (south) gate and contains a disaster preparedness unit. Figure 2.3 shows Pope AFB.

HISTORY

Pope AFB was established in 1919 and has been in continuous operation since that time. Initially the balloons and planes at the base were used for aerial photography, artillery spotting, forest fire reporting and carrying mail. In the 1920's base activities were minimal; facilities consisted of a few planes and a motor pool. In the 1930's facilities were expanded to include two aircraft hangers, a balloon hanger, and a few other buildings.

The base's airlift activities began during World War II. Air and ground crews trained at Pope along with Army airborne units for airbornes and aerial resupply missions. Pope became independent of Army control in 1947. During the early 1950's, the base was used as a part of the Tactical Air Command's mission.

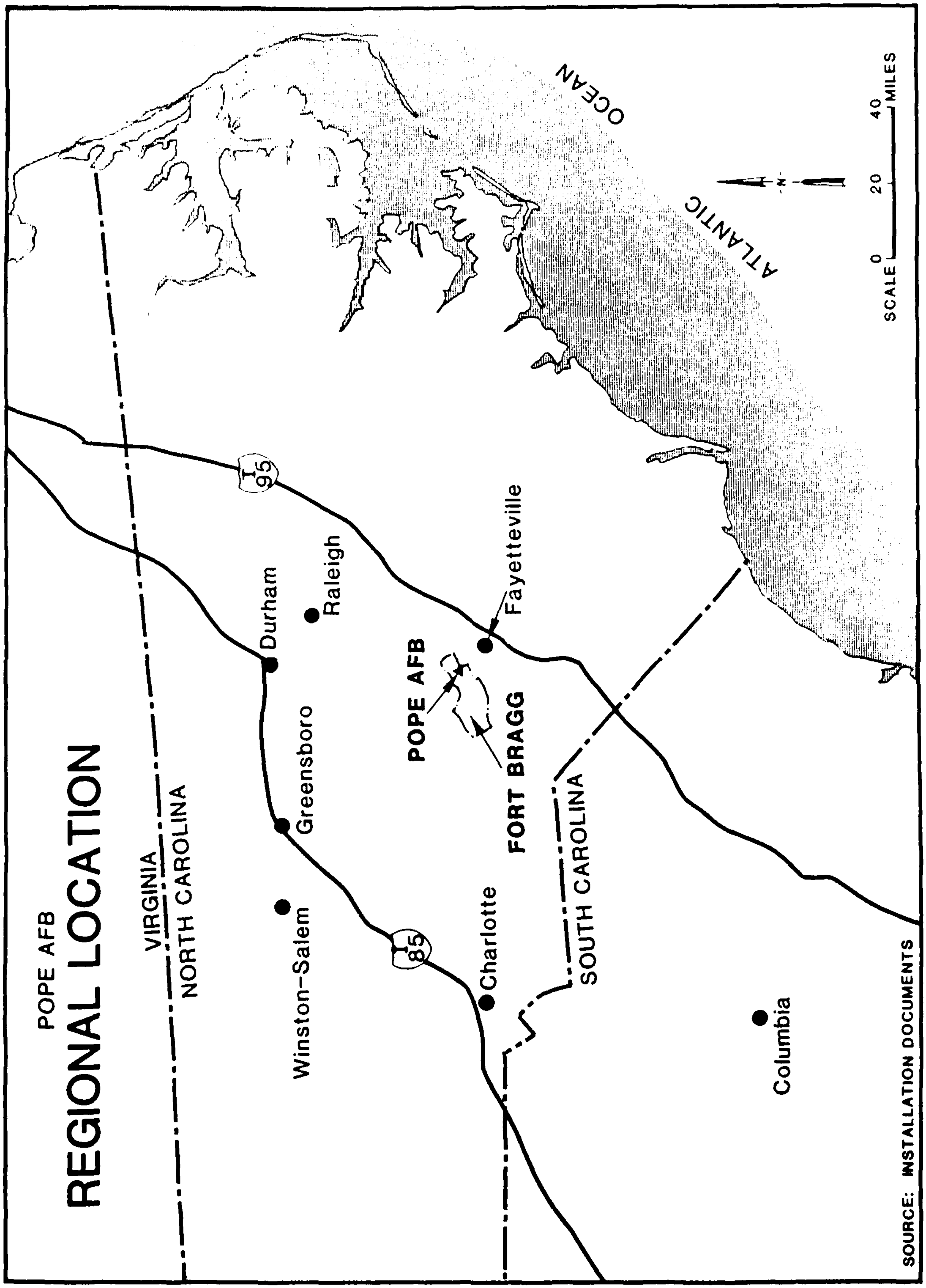


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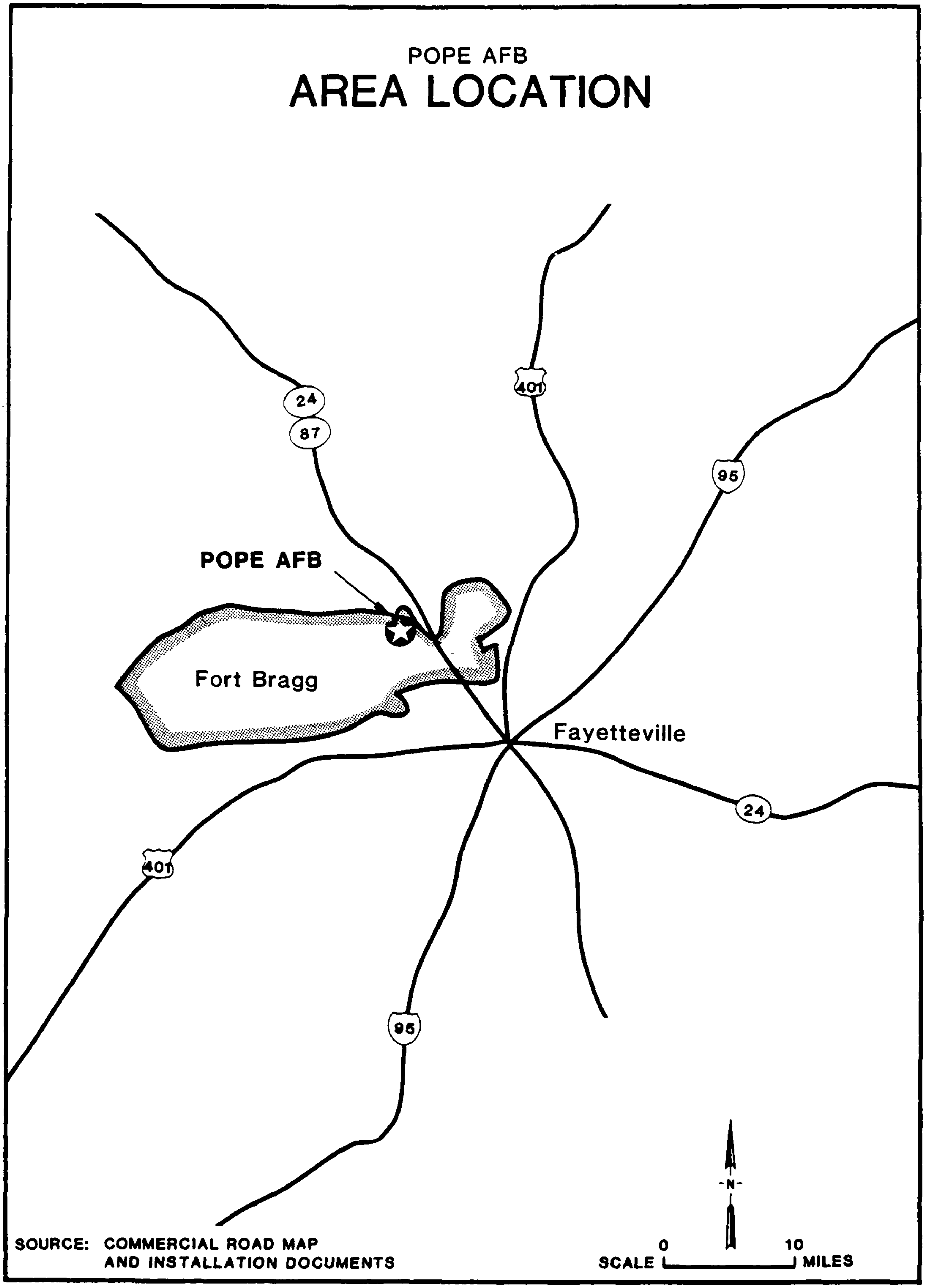
FIGURE 2.2



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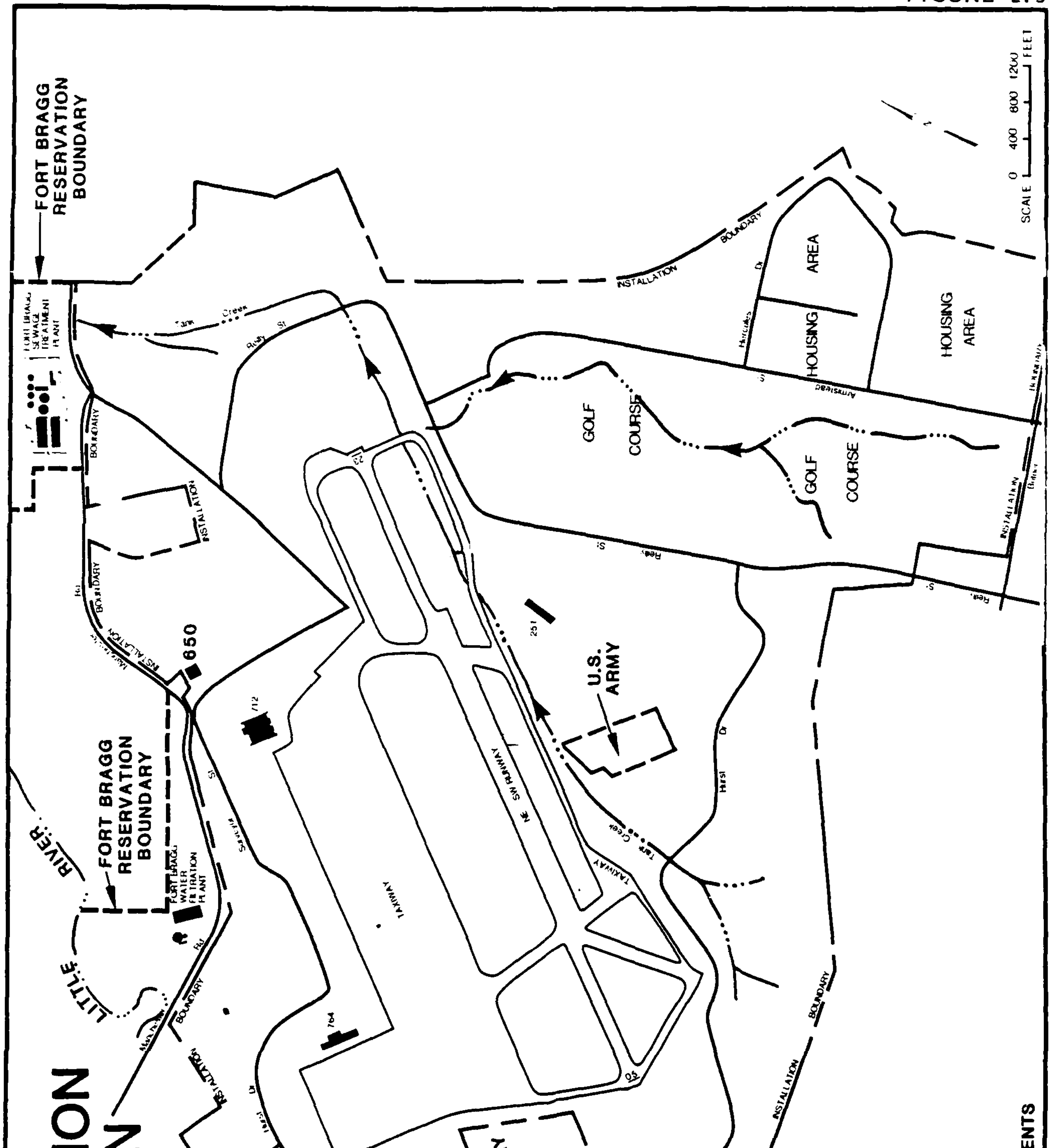


POPE AFB
INSTALLATION SITE PLAN

SOURCE: INSTALLATION DOCUMENTS

In 1954-1955, the base went through a major period of facility expansion to meet a renewed tactical airlift mission. The main runway was extended to accomodate new aircraft and the other two runways were converted to taxiways and parking aprons. Many of the existing buildings and other facilities were developed during this time period.

The airlift mission at Pope AFB has continued as the primary activity since the mid 1950's. Coordinated activities with Fort Bragg Army airborne units has been maintained during this time period. In 1975, the USAF Airlift Center was established at the installation. The Center is the Air Force focal point for all strategic and tactical airlift development, testing and evaluation of new equipment and new operations.

ORGANIZATION AND MISSION

The host unit at Pope AFB is the 317th Tactical Airlift Wing. Major units within the Wing include Resource Management, Operations, Maintenance, Air Transport and the 317th Combat Support Group.

The primary mission of the 317th Tactical Airlift Wing is to organize, equip and train for tactical airlift operations on a global basis. In support of the USAF Airlift Center at the base, the 317th is involved in development, testing and assessment of new airlift techniques and equipment. All supply, transportation and other logistical support is provided by Resource Management. Operations is responsible for the airlift squadrons. Maintenance provides the resources for all aircraft repair and replacement activities. Air Transport provides direction on movement procedures for personnel and equipment and the 317th Combat Support Group manages and maintains all base facilities and service functions.

Major tenant organizations at Pope AFB are listed below. Description of the mission for several of the tenants are presented in Appendix C.

- 1st Aeromedical Evacuation Squadron
- 215th Field Training Detachment
- 1943rd Information Systems Squadron
- Detachment 21, 15th Weather Squadron

- Detachment 12, 1600th Management Engineering Squadron
- Air Force Office of Special Investigations, Detachment 2101
- Area Defense Counsel, Detachment QD2Q
- 53rd Mobile Aerial Port Squadron

SECTION 3

ENVIRONMENTAL SETTING

The environmental setting of Pope Air Force Base is described in this section with the primary emphasis directed toward identifying conditions or features that may facilitate the migration of hazardous waste-related contamination due to past waste management practices. A summary of pertinent environmental conditions relevant to this study are listed at the end of this section.

CLIMATE

The study area is located within the Cape Fear River Basin of southeastern North Carolina. The area experiences a typical humid subtropical type of climate with warm summers and cold winters. Annual mean precipitation at the installation is 46.9 inches, based on a period of record of 43 years (Table 3.1). The average monthly precipitation varies little throughout the year; there are no principally wet or dry seasons. A review of seasonal rainfall distribution maps for the Cape Fear Basin does indicate that slightly more precipitation occurs over the basin during the summer than in any other season. Temperature in the basin may vary from 106 to minus 5°F. Temperatures tend to be the lowest during January and February and the highest during June and July. The prevailing wind direction is from the southwest during most of the year. Northerly winds may be common during the September to November period.

The net annual precipitation (precipitation minus evaporation) calculated for the Pope AFB area is 4.9 inches, based upon National Oceanographic and Atmospheric Administration data (NOAA, 1983). The calculation of net precipitation does not consider evapotranspiration, which varies greatly according to season. The low calculated value of net precipitation suggests there is a moderate potential for the infiltration of rainfall or snowmelt into the subsurface. The one year

TABLE 3.1
CLIMATIC CONDITIONS

Month	Mean Daily Temperature Max (°F)	Mean Daily Temperature Min (°F)	Monthly Rainfall Precipitation Mean (in)	Monthly Rainfall Precipitation Max (in)	Monthly Snowfall Precipitation Mean (in)	Monthly Snowfall Precipitation Max (in)	Wind Mean Speed (kt)	Wind Prevailing Direction
Jan	53	32	3.4	6.6	1	10	4	WSW
Feb	56	33	3.7	7.9	1	11	5	WSW
Mar	64	40	4.0	7.8	1	11	5	W
Apr	74	49	3.3	7.4	0	0	5	SW
May	81	58	3.6	8.0	0	0	4	SW
June	87	66	4.4	8.0	0	0	4	WSW
Jul	89	70	6.2	15.8	0	0	3	SW
Aug	88	69	5.2	13.1	0	0	3	SW
Sep	83	63	4.0	12.0	0	0	3	NE
Oct	74	50	2.9	10.4	0	0	3	N
Nov	64	40	3.0	10.0	#	#	4	N
Dec	55	33	3.2	8.1	1	26	4	WSW
							4	SW

#: Trace
Period of Record: 1937-1980
Source: Detachment 21, 15th Weather Squadron, Pope AFB, NC.

852J34

24-hour rainfall value for the study area is reported to be 3.2 inches annually (USDC, WB, 1961). This value indicates that the potential for erosion is moderate to high in the study area, irrespective of slope and soil conditions.

GEOGRAPHY

The study area lies within the Sand Hills Section of the Inner Coastal Plain subdivision of the Atlantic Coastal Plain Physiographic Province. The Sand Hills occur primarily in northwestern Cumberland County and appear as long ridges and rounded hills separated by narrow plains. Erosional dissection is prominent. Figure 3.1 depicts study area physiographic divisions.

Topography

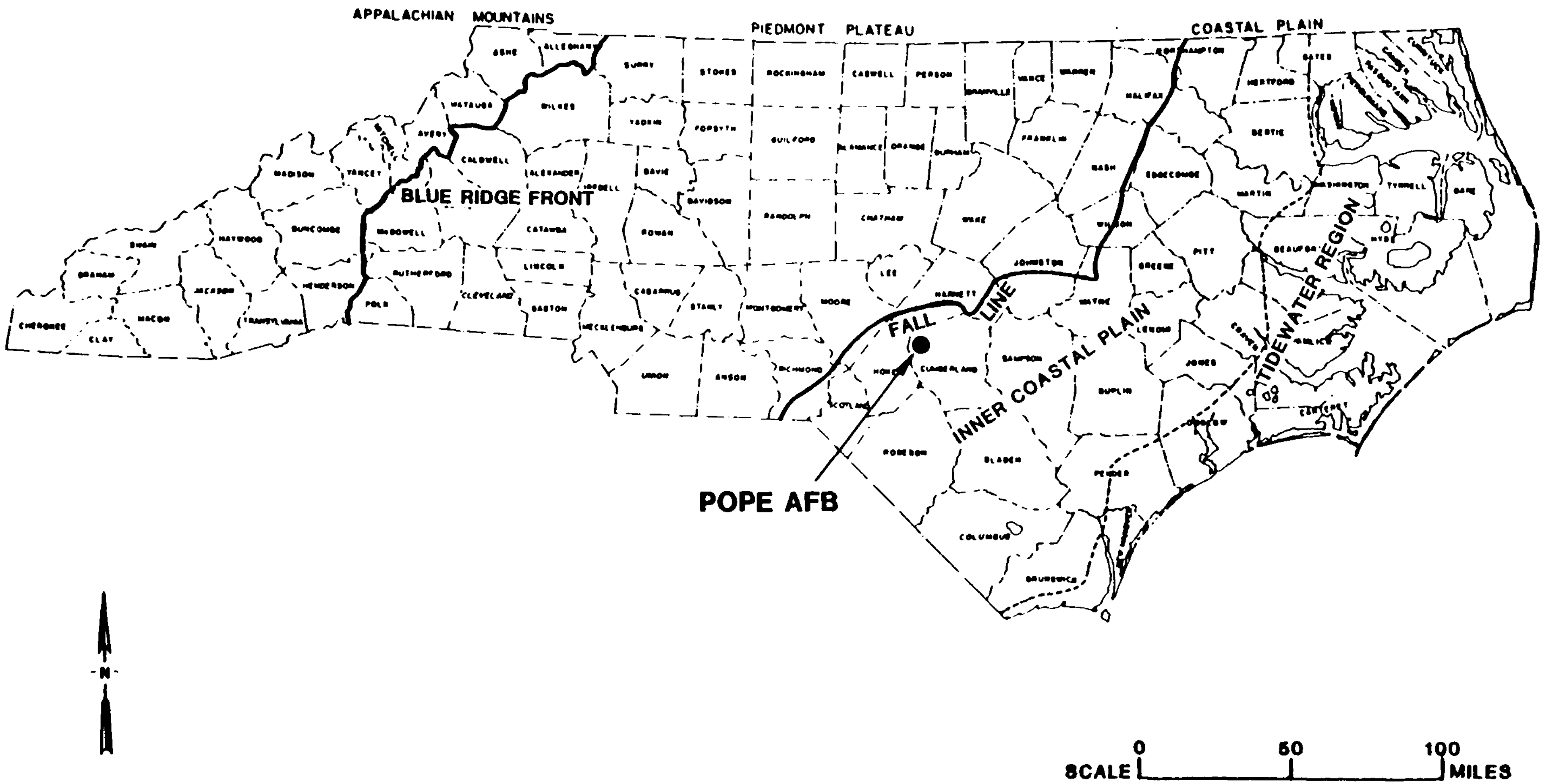
The installation airfield and industrial (shop) areas are situated in the relatively level Little River alluvial valley. The general appearance of the base is that of a northward sloping upland gradually merging with a level floodplain. The surface elevation of this portion of the base averages 200 feet, National Geodetic Vertical Datum of 1929 (NGVD). The administrative, housing and recreational facilities are located on the sloping south half of the base. In this area, ground surface elevations range from 280 feet, NGVD near the intersection of Reilly and Butner Roads to 200 feet, NGVD along Taxiway No. 10. The lowest surface elevation surveyed on base is 170 feet NGVD, along the Tank Creek stream channel near the Fort Bragg sewage treatment plant. Installation relief is primarily the result of stream channel improvement or due to site use modifications. Relief of about fifteen feet is apparent along the Tank Creek tributary extending through the base golf course.

Drainage

Pope AFB drainage is accomplished by overland flow to diversion structures and drainage ditches and finally to local surface streams. Runoff originating from the base administrative, housing and recreational areas is directed via ditches, storm drains and tributaries to Tank Creek, the installation's primary stream. Runoff originating from the airfield and industrial areas flows via storm drains and ditches to unnamed tributaries of the Little River. Drainage flowing from the

POPE AFB

Physiographic Divisions of North Carolina



SOURCE: STUCKEY, 1965

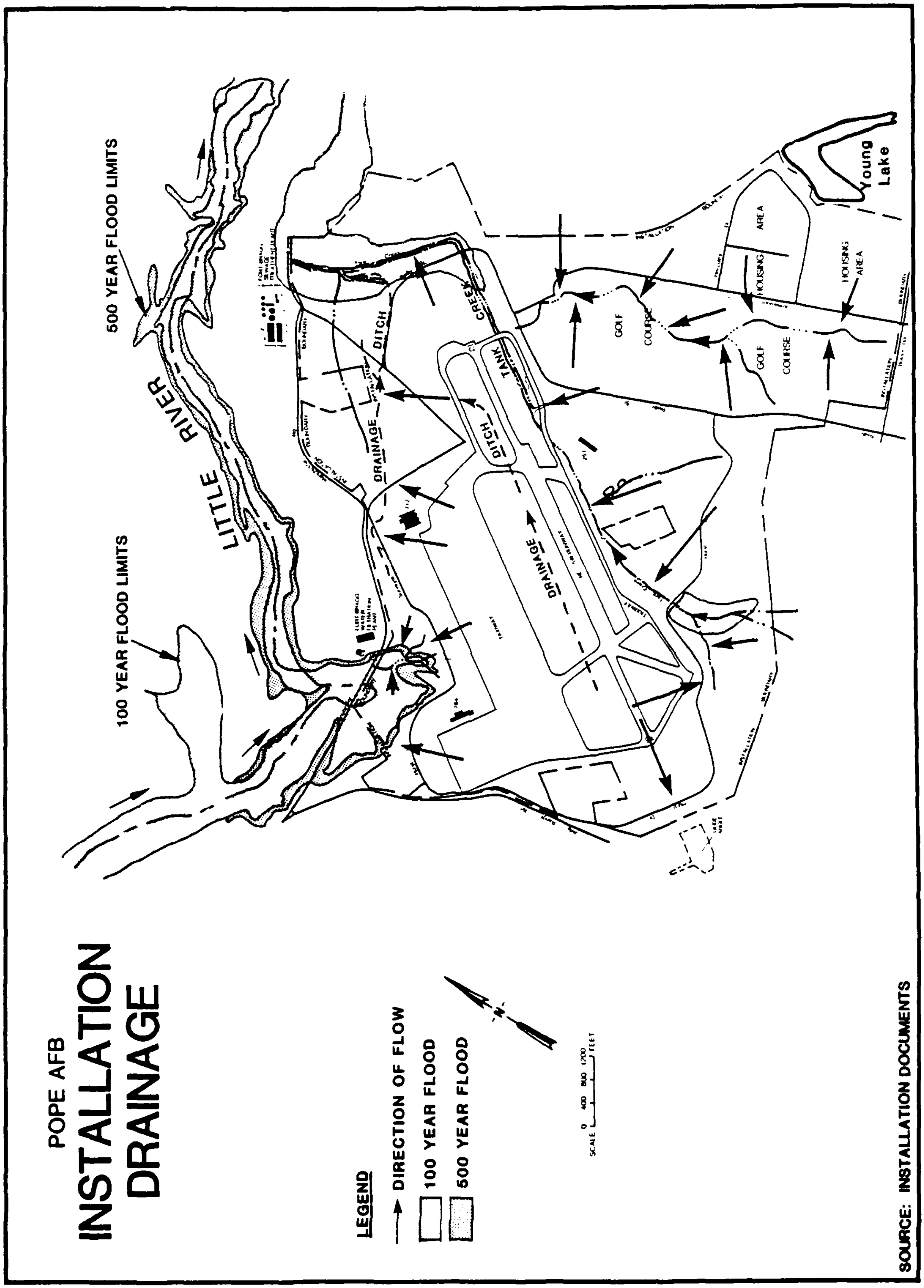
northeast section of the airfield and from the vicinity of Taxiway No. 10 is directed toward Tank Creek. Installation drainage features are depicted in Figure 3.2.

Flooding information relative to Pope AFB was obtained from the Federal Emergency Management Agency Flood Insurance Rate Map for Cumberland County, NC (1982) and the U.S. Geological Survey Map of Flood-Prone Areas, Overhills Quadrangle, NC (undated). Both sources indicate that flooding may occur along the course of the Little River. The maximum extent of inundation during a 100-year event is reported to be on the order of 160 feet, MSL and near 170 feet during a 500-year event. The USGS Flood-Prone Areas Map suggests that the zone of inundation would likely be less than 180 feet. Inundation to this elevation should not impact the adjacent base industrial area or any of the waste management facilities identified at Pope AFB.

Localized flooding may occur along portions of the course of Tank Creek. Two such areas have been identified and include the low area northeast of the main instrument runway and a small isolated zone located approximately 1,200 feet west of the existing Fire Protection Training Area (FPTA). Both areas could be flooded due to the temporary impoundment of runoff during a storm. It is believed that the area northeast of the main runway could be inundated to an approximate elevation of 177 feet, MSL during a 100-year event. The small area west of the FPTA, which is a restricted stream channel, could conceivably flood to an elevation of 200 feet. The flooding of either area would not be expected to impact the management of waste materials at Pope AFB.

Surface Soils

The surface soils of Pope AFB have been mapped by the U.S. Department of Agriculture, Soil Conservation Service (1984). Modern soils found within the study area have formed over alluvial sand, silt and clay. Most installation soils are fine to medium grained sands, free draining, permeable and possessing high water tables. All of the soil units identified on base impose severe restrictions on the development of waste management facilities. Table 3.2 summarizes the principal


POPE AFB
INSTALLATION
DRAINAGE
LEGEND
DIRECTION OF FLOW
100 YEAR FLOOD
500 YEAR FLOOD
SCALE 0 400 800 1200 FEET
N
100 YEAR FLOOD LIMITS
500 YEAR FLOOD LIMITS
LITTLE RIVER
DRAINAGE DITCH
CREEK
DITCH TANK
DRAINAGE
GOLF COURSE
GOLF COURSE
HOUSING AREA
HOUSING AREA
Young Lake
SOURCE: INSTALLATION DOCUMENTS

characteristics of the seventeen soil units that have been identified within installation boundaries. Figure 3.3 is a map of Pope AFB soil units.

GEOLOGY

The geology of the Cumberland County area has been reported by Spangler (1950); the NC Division of Mineral Resources (1958); Stuckey and Conrad (1958); and Schipf (1961) and Stuckey (1965). Additional information has been obtained from an interview with a U.S. Geological Survey scientist. The following subsections represent a brief overview of the base geological features.

Stratigraphy

Geologic units ranging in age from pre-Cambrian to Pleistocene have been identified in the Inner Coastal Plain of North Carolina. Table 3.3 summarizes the major units and presents their significant characteristics. The lithologies of these units range from unconsolidated materials to sedimentary rocks, reposing on a crystalline rock basement complex.

Distribution

The surface distribution of geologic units relevant to this study is presented in Figure 3.4, which has been modified from the North Carolina State Geologic Map (NC Division of Mineral Resources, 1958). Generally, the geology of Pope AFB is dominated by moderately thick sections of interbedded marine sands and clays of the Tuscaloosa/Cape Fear Formations. The degree of interbedding is highly variable and it is reported that individual layers within major formations cannot be traced over great distances due to lithological variations or past erosional effects following depositional cycles. Eroded remnants of the Castle Hayne Limestone probably cap some of the higher hills within Fort Bragg (Schipf, 1961). Surficial sediments and leached Tuscaloosa/Cape Fear beds form a mantle some twenty feet thick in much of the study area. These surficial materials were encountered by numerous installation borings drilled prior to the construction of many base facilities. The borings indicate that base surface geology consists of predominantly sandy deposits with some silts and clays present. The Tuscaloosa/Cape

TABLE 3.2
POPE AIR FORCE BASE SOILS

Map Symbol	Description	USDA Texture (Major Fraction)	Thickness (Inches)	Unified Classification (Major Fraction)	Permeability (In/Hr)	Disposal Site Use Constraints
70B	Wagram urban land complex 0 to 8% slopes	Loamy sand, sand, sandy clay loam.	75	SM,SP-SM,SC	0.6-20	Severe. Moderate to high permeability
75B	Blaney urban land complex 2 to 8% slopes	Sand, loamy sand, sandy clay, sandy clay loam.	65	SPP,SM,SC	0.2->20	Severe. Permeability
75D	Blaney urban land complex,	Sand, loamy sand, sandy clay, sandy clay loam.	65	SP,SM,SC	0.2->20	Severe. Permeability
76B	Lakeland urban land complex, 1 to 8% slopes	Sand.	80	SP-SM,SP	6.0-20	Severe. Permeability
80	Deloss soils	Loamy sand, loam, sandy clay, clay.	80	SM,SC,ML,CL	0.07-0.18	Severe. Water table 1 foot below grade. Unit subject to seasonal flooding.
460	Pactolus loamy sand	Loamy sand, sand.	80	SP-SM,SM	6.0-20	Severe. Water table 1.5 to 3.0 feet below grade.
544A	Altavista loam	Loam, loamy sand, sandy clay, clay.	60	SM,ML,CL,SC	0.6-20	Severe. Permeability
552	Roanoke loam	Loam, silt loam, sandy loam, clay silty clay, clay, clay loam.	72	SM,SC,CL,CH,ML	0.06-2	Severe. Water table near surface. Unit subject to seasonal flooding.
574B	Gilead loamy sand, 2 to % 8 slopes	Loamy sand, gravelly loamy sand, sandy loam, sandy clay.	80	SM,SC,CL	0.06-6.0	Severe. Water table feet below grade

TABLE 3.2
POPE AIR FORCE BASE SOILS
(Continued)

Map Symbol	Description	USDA Texture (Major Fraction)	Thickness (Inches)	Unified Classification (Major Fraction)	Permeability (In/Hr)	Disposal Site Use Constraints
575B	Blaney loamy sand, 2 to 8% slopes	Loamy sand, sand, sandy clay, sandy clay loam.	65	SP,SM,SC	0.2->20	Severe. Permeability.
575D	Blaney loamy sand 8 to 15% slopes	Loamy sand, sand, sandy clay, sandy clay loam.	65	SP,SM,SC	0.2->20	Severe. Permeability.
576D	Vaucluse loamy sand, 8 to 15% slopes	Loamy sand, sandy clay loam	73	SM, SC, SP-SM	0.06-20	None.
709B	Tarboro loamy sand 0 to 6% slopes	Loamy sand, sand.	80	SP,SM,SW-SM	6.0->20	Severe. Permeability.
730B	Blanton sand 1 to 8% slopes	Fine sand, sandy clay, sandy loam	80	SP-SM,SC,SM	0.06-6.0	Severe. Permeability. Water Table 5-6 feet below grade.
812	Johnston Loam	Loam, sandy loam, sand.	60	SM,ML,CL,OL	0.06-0.26	Severe. Water table 1 foot (±) below grade. Unit subject to seasonal flooding.
TR	Torlunta and Lynn Haven Soils	Loamy sand, sand	72	SM, SP-SC	2.0-20	Severe. Permeability.
B.P.	Borrow Pit	Sand, gravel	varies	varies	Probably greater than 5.0	Severe. Permeability.

* Estimated by Engineering-Science

Source: USDA, SCS, 1984

FIGURE 3.3

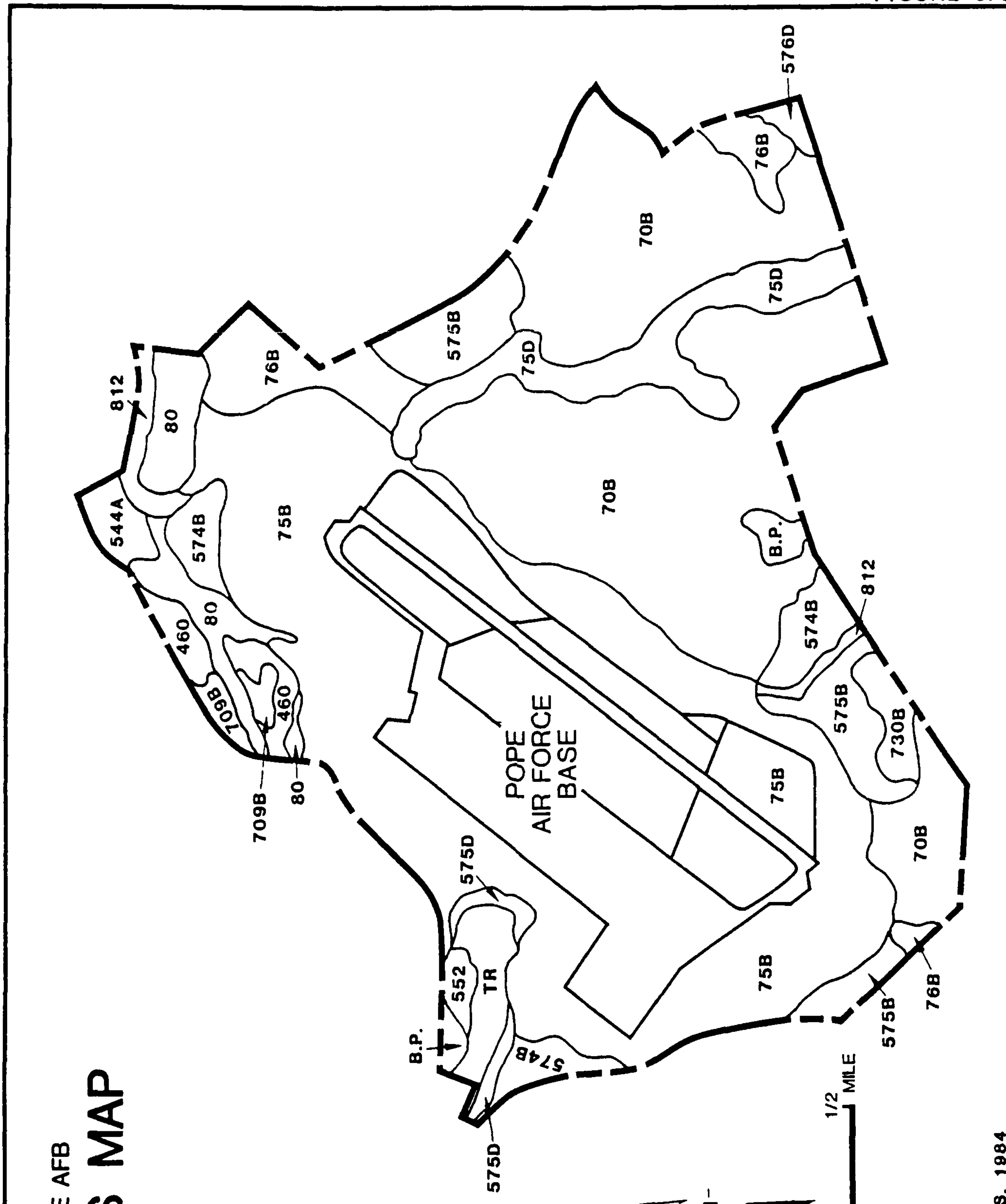


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TABLE 3.3
STUDY AREA
GEOLOGIC UNITS

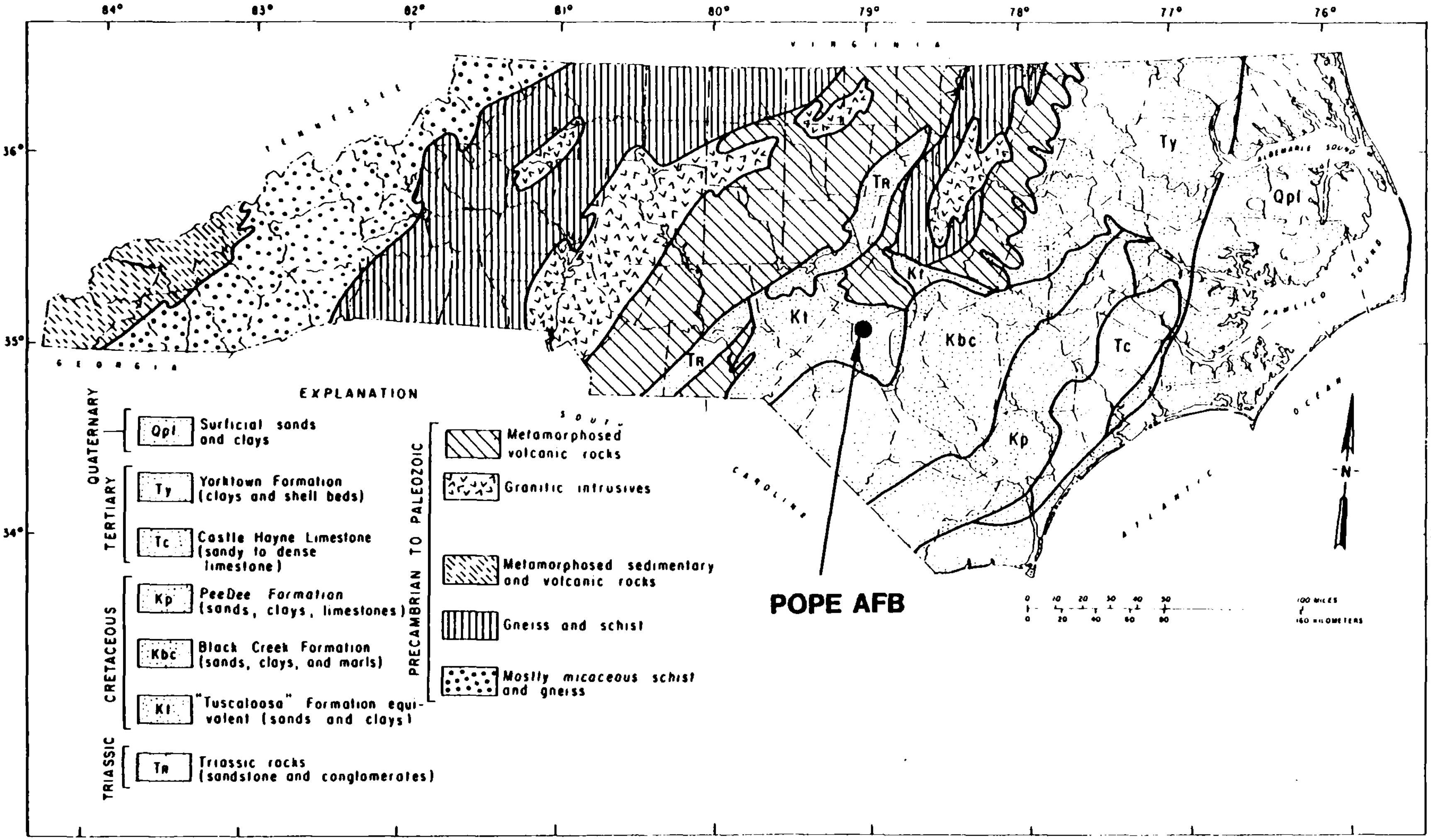
System	Series	Formation		Thickness (feet)
Quaternary	Pleistocene-Miocene	Surface and alluvial deposits:	Sand, gravel, silt, clay deposited on flood plains and along major streams.	40-80
Tertiary	Late Miocene	Yorktown Formation:	Gray massive marine clay (discontinuous)	0-60
	Eocene	Castle Hayne Formation:	Limestone, sand, shells (scattered outliers)	0-40
Cretaceous	Late	Pee Dee Formation:	Interbedded sands, clays limestone	0-50
		Black Creek Formation:	Marine sands, clay, silt interbedded with shell layers.	65-250
		Tuscaloosa Formation: (now called Cape Fear)	Sand and clay, interbedded	80-220
Pre-Cambrian	--	Basement Complex:	Slate and volcanics	unknown

Source: Modified from Stuckey (1965) and Spangler (1950)

FIGURE 3.4

POPE AFB

North Carolina Geologic Map



SOURCE: HEATH, 1980

Fear Formation is reported to be 120 feet thick in the northwest corner of Cumberland County at Fort Bragg.

Structure

The Coastal Plain sediments form a wedge with the point of origin at the Fall Line north of Pope AFB in Harnett County (Figure 3.1), and gradually thicken toward the ocean. At the Fall Line, which is a broad band and not a discrete line of demarcation, the sediments are only a few inches thick; at Cape Hatteras, their total accumulation amounts to some 10,000 feet (Stuckey and Conrad, 1958). Individual geologic units within the Coastal Plan, such as the Tuscaloosa/Cape Fear, thicken in a downdip (southeast) direction and possess a unit dip of ten to twelve feet per mile which is relatively flat-lying. These units are not known to be disrupted by faulting or other geologic discontinuities in the project area; however, past dispositional effects such as current bedding are known to cause some isolated strata to occur at steeply dipping angles or to be replaced abruptly on a local scale (Stuckey and Conrad, 1958). Figure 3.5, a generalized subsurface section of the North Carolina Coastal Plain, depicts the significant structural conditions of the major geologic units. Although the base is located several miles from the cross-section alignment (Figure 3.5), the information is considered to be representative of the entire North Carolina Coastal Plain.

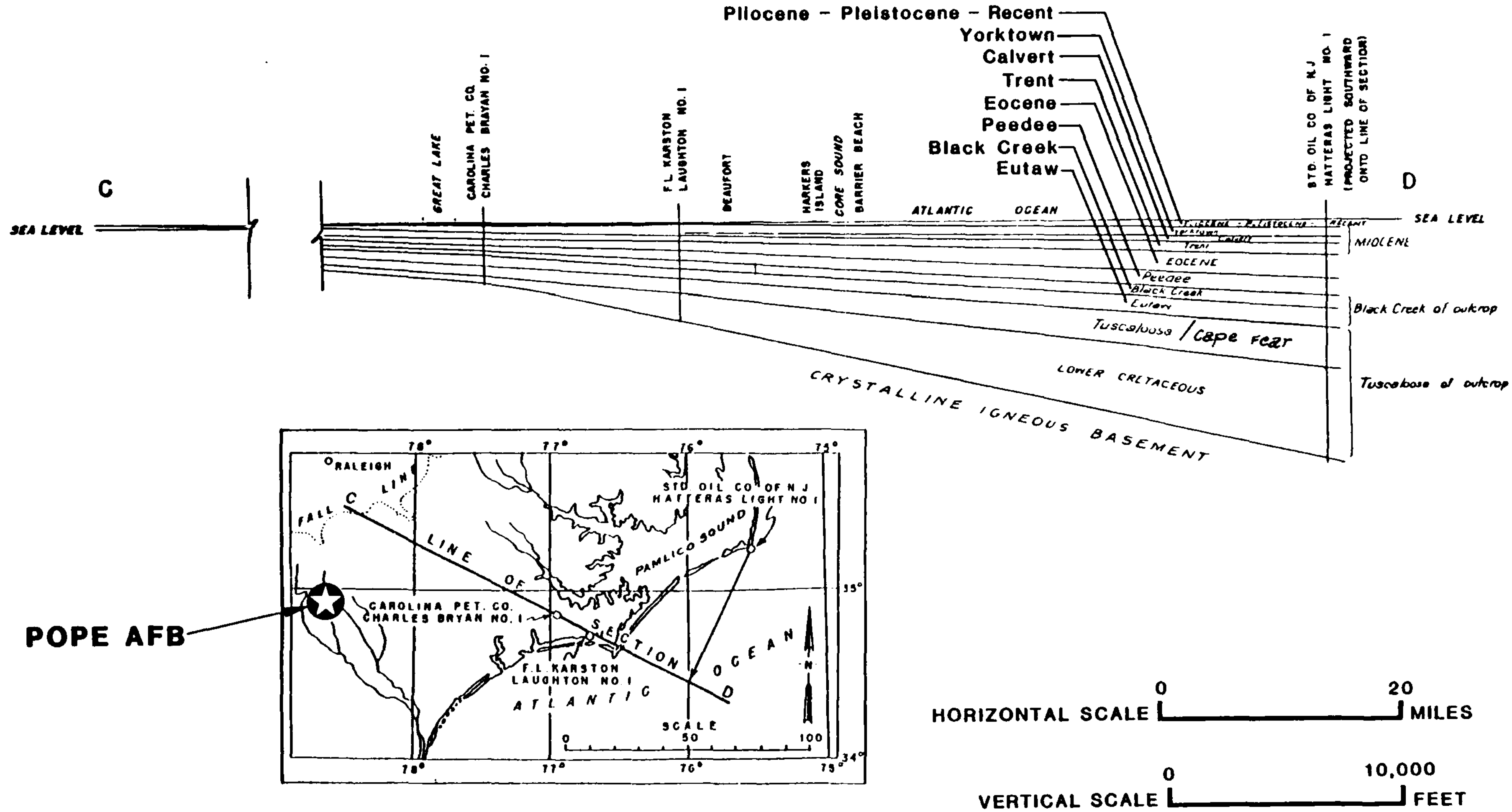
GROUND-WATER RESOURCES

The Upper Sandy Aquifer consists of post-Miocene sediments and is about twenty feet thick east of the installation at the community of Spring Lake. This unit is reported to range in thickness from twenty to thirty feet at Fort Bragg, but its thickness and extent is not known at Pope AFB. Ground water generally occurs in the Upper Sandy Aquifer at shallow depths under unconfined conditions. The Soil Conservation Service (1984) noted that ground water was usually present within six feet of land surface in many of the soil units mapped on base. The unit is recharged directly by precipitation. Most of the base is located in the recharge zone of this aquifer. Presumably, its discharge is directed either to local surface waters as baseflow, or to lower aquifers as recharge. The Upper Sandy aquifer is not known to be a source of water

FIGURE 3.5

POPE AFB

Generalized Geologic Section of Coastal Plain



SOURCE: SPANGLER, 1950

supplies in the vicinity of Pope AFB, but probably is a source of recharge to lower aquifers.

Ground-water hydrology of the study area has been reported by Schipf (1961); Robison and Mann (1977); Park (1979) and Heath (1980). Additional information has been obtained from an interview with a U.S. Geological Survey Water Resources Division scientist and from officials of the North Carolina Division of Environmental Management.

Hydrogeologic Units

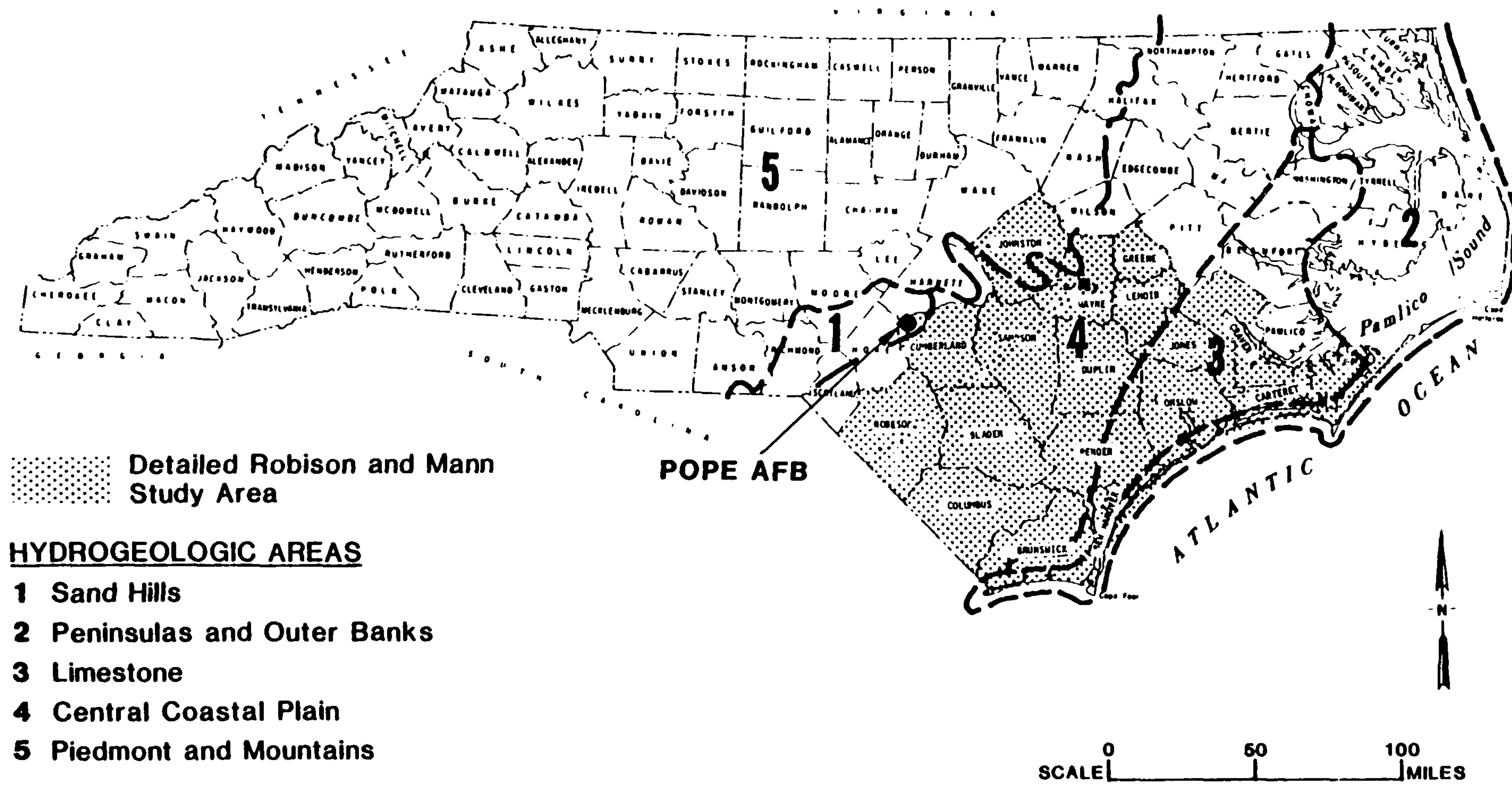
Pope AFB is located within the Sand Hills Hydrogeologic Area of North Carolina as shown in Figure 3.6. Several hydrogeologic units have been identified in this area including the Upper Sandy Aquifer, the Limestone Aquifer, the Lower Sandy Aquifer and the Crystalline Bedrock Aquifer. Their approximate relationships are shown on the generalized hydrogeologic cross-section in Figure 3.7. Although Pope AFB is several miles away, this is considered representative.

The Castle Hayne Limestone and correlative geologic units form the Limestone Aquifer. While the Castle Hayne may be present at Fort Bragg as eroded remnants, it does not occur in the study area as a usuable aquifer and is therefore not considered to be significant to this investigation.

The Lower Sandy Aquifer consists of the Black Creek and Tuscaloosa/Cape Fear Formations. The Lower Sandy Aquifer is a hydrogeologic unit of regional significance and is the primary source of ground-water resources in the study area. Because of lithologic and stratigraphic conditions, individual study area wells tapping this aquifer are generally limited to yields of 250 gallons per minute or less (Heath, 1980). At Spring Lake, the Upper and Lower Sandy Aquifers are known to be separated by a tight confining bed (the USGS designation of this confining unit is CB-3). The confining bed is not continuous and therefore may not exist at Pope AFB. The Lower Sandy Aquifer occurs at or near ground surface at the base; it is about sixty feet thick near Building 650. This aquifer is reported to be recharged chiefly by precipitation. Due to its location relative to the installation, Pope AFB lies within the recharge zone of this major aquifer. In the recharge zone, ground water exists under water table conditions; further downdip (seaward), it may

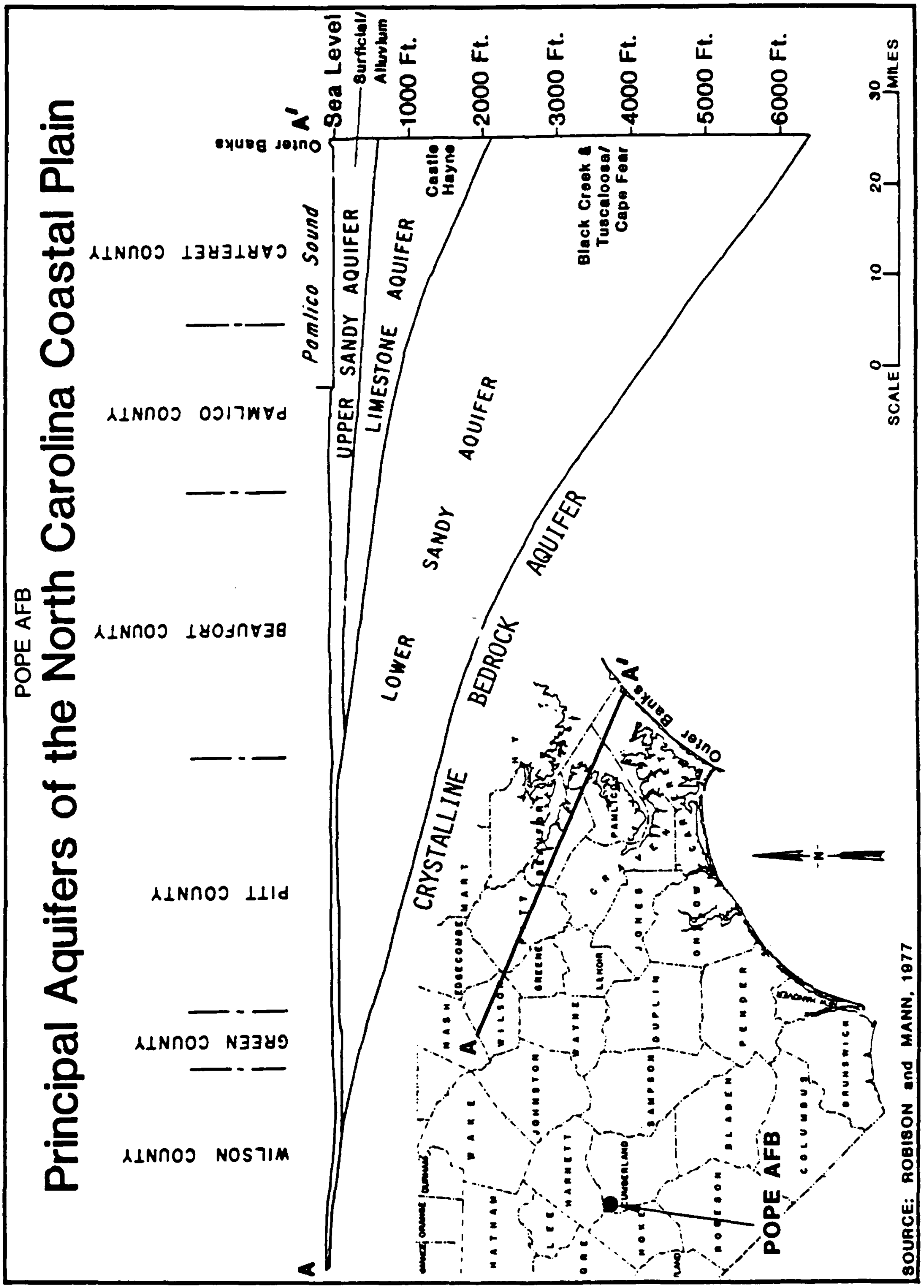
POPE AFB

Central Coastal Plain Aquifer Area



SOURCE: ROBISON and MANN, 1977

FIGURE 3.7



POPE AFB
Principal Aquifers of the North Carolina Coastal Plain
A
A'
WILSON COUNTY
GREEN COUNTY
PITT COUNTY
BEAUFORT COUNTY
PAMLICO COUNTY
CARTERET COUNTY
Pamlico Sound
Outer Banks
Sea Level
Surficial/Alluvium
1000 Ft.
2000 Ft.
3000 Ft.
4000 Ft.
5000 Ft.
6000 Ft.
UPPER SANDY AQUIFER
LIMESTONE AQUIFER
Castle Hayne
LOWER SANDY AQUIFER
Black Creek & Tuscaloosa/ Cape Fear
CRYSTALLINE BEDROCK AQUIFER
SCALE
0
10
20
30
MILES
POPE AFB
N
SOURCE: ROBISON and MANN, 1977

be present under artesian conditions at moderate depths below land surface. Locally, consumptive use may modify this trend.

The lowest (stratigraphically) hydrogeologic unit in the area is the Bedrock Aquifer. This unit is composed of crystalline or volcanic consolidated materials which contain ground water in fractures, fissures, faults or other secondary openings. Water is obtained from the bedrock by drilling wells sufficiently deep to connect many of these open zones which would permit the inflow of adequate quantities. The bedrock probably receives its recharge from overlying units. Little is known regarding its hydrologic characteristics in Cumberland County and more prolific aquifers exist at shallower depths. The bedrock aquifer is of litle consequence in the project area and is known to be utilized by only one consumer near Pope AFB. Figure 3.8 is the log of a well installed at a commercial establishment located about one hundred feet northwest of Building 650. This figure illustrates local hydrogeologic conditions and the stratigraphic relationships of the two principal aquifers present in the study area. Bedrock was encountered at a depth of 88 feet below grade at this location.

Water Use

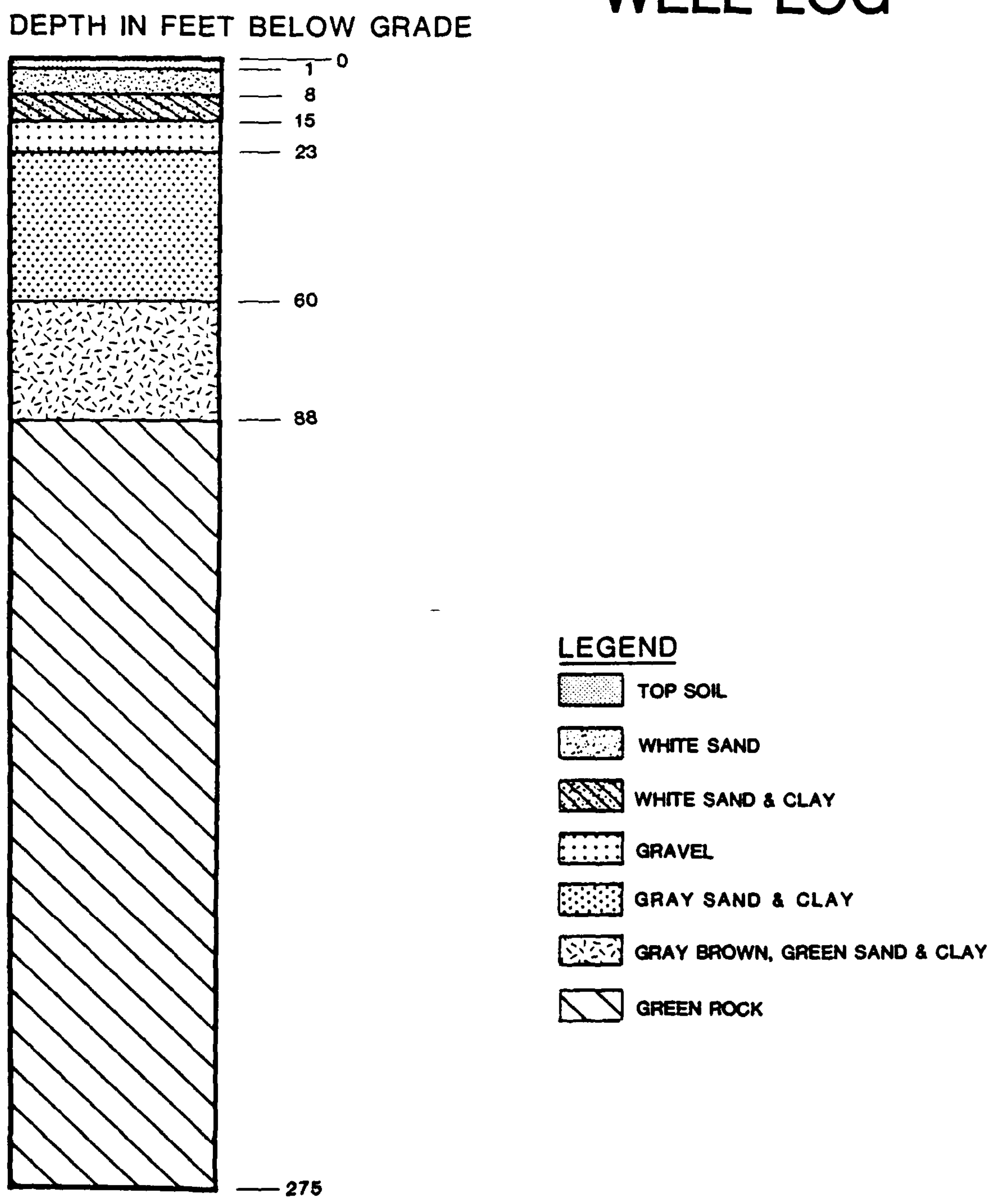
Pope AFB obtains its water supplies from the Fort Bragg water treatment plant. The Fort Bragg plant withdraws water from the Little River near Pope AFB. Water consumers such as Spring Lake, several mobile home parks and a few individual homes or businesses located near Pope AFB derive water supplies from wells constructed into either the Lower Sandy Aquifer or the Bedrock Aquifer. Two wells finished into the Lower Sandy Aquifer are located on the site of the former M and W Mobile Home Park (the recently acquired tract of land near the base 600 area). These last two wells will be abandoned as Pope AFB will not require their continued use. The locations of study area wells are shown in Figure 3.9. Larger communities in the region rely on surface supplies because large quantities of water cannot be obtained from individual wells installed into either of these aquifers.

Water Quality

The quality of water obtained from the Lower Sandy Aquifer is reported to be good by Robison and Mann (1977) and by recent NC DEM file data (1985). Water derived from this unit is typically soft, low in

POPE AFB

LOCAL AREA WELL LOG



LOCATION: Quick Stop Store, 100 ft. Northwest of Building 650 (See Figure 2.3)

SOURCE: NC DEM FILES

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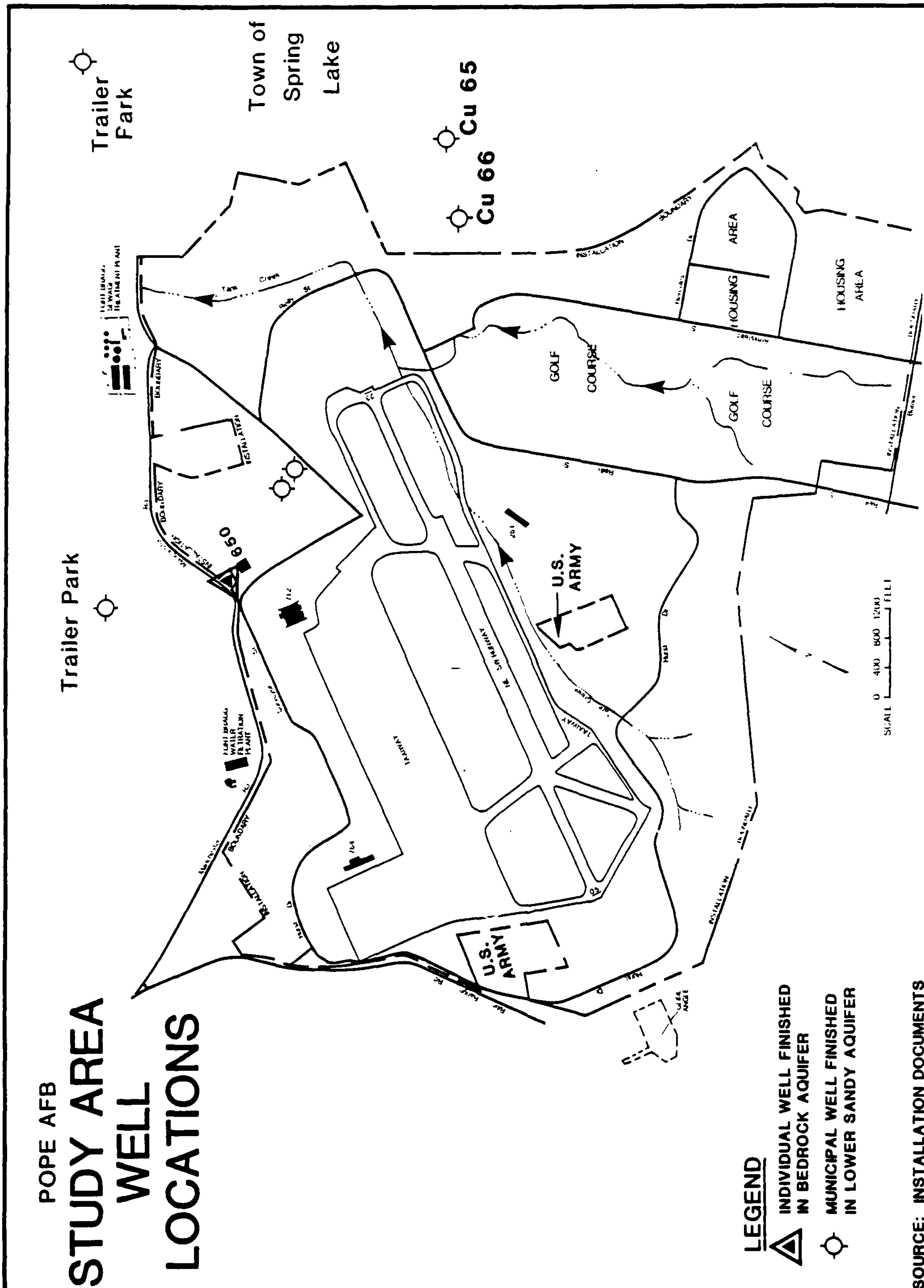

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dissolved solids, iron and other metals. It may be slightly acidic. Water obtained from the Bedrock Aquifer may be hard and high in dissolved solids content.

SURFACE-WATER RESOURCES

Stream Classifications

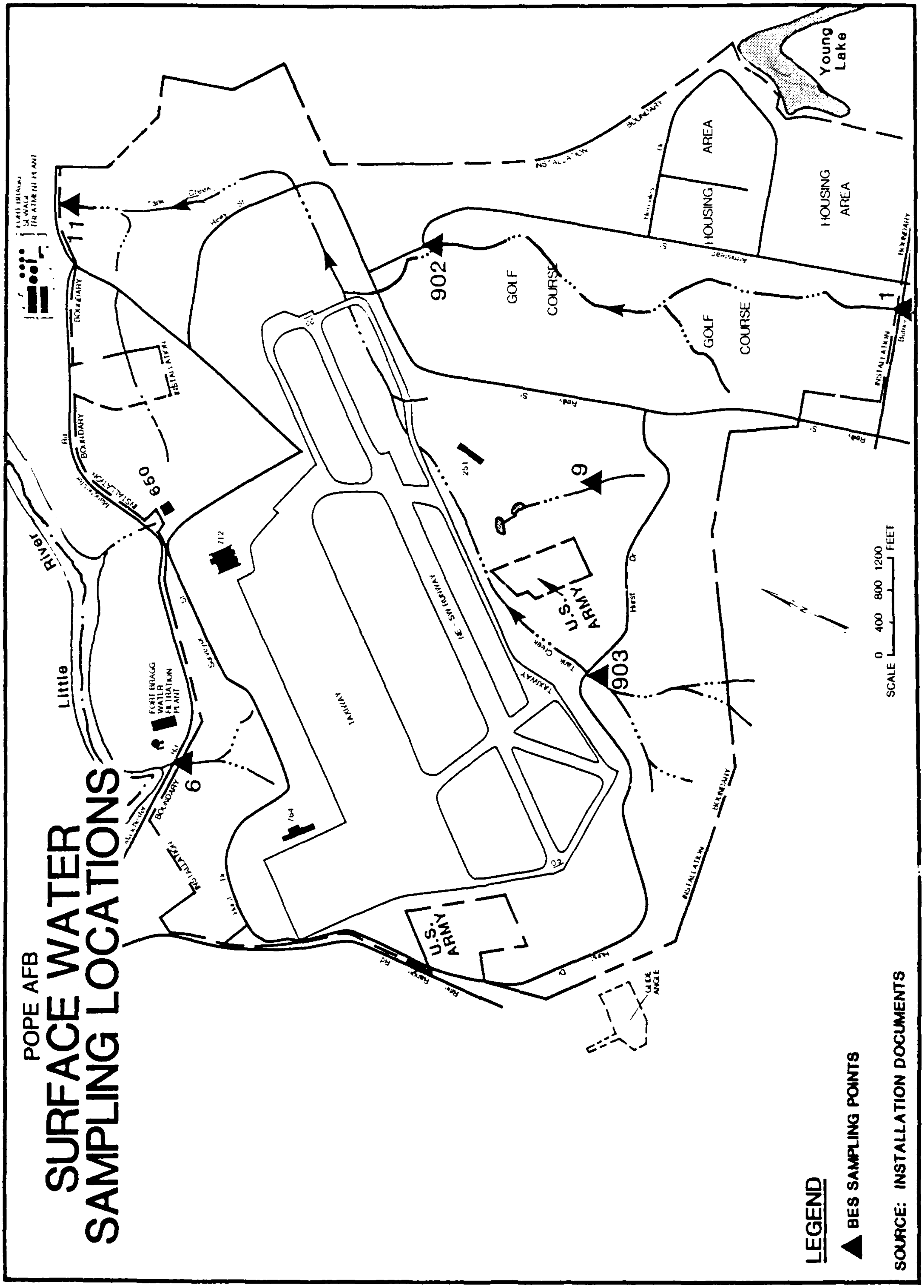
All surface drainage originating from Pope AFB eventually flows into the Little River (below the Fort Bragg water treatment plant intake). Surface runoff may either enter the river via unnamed tributaries from the base or flow to the river via Tank Creek. The Little River and Tank Creek are designated "Use Classification C" waters by the State of North Carolina (North Carolina Administrative Code Title 15, 2:2B.0100-.0200). Class C waters are suitable for secondary contact recreation and for fish and wildlife propagation. The Little River is monitored routinely by the NC Division of Environmental Management for water quality maintenance. The monitoring point downstream from Pope AFB is located near the bridge where State Highway 87 crosses the Little River (NC DEM monitoring station number 0210 3000). Samples were collected monthly during the period October 1983 to September 1984; no sample was collected for December 1983. A review of the tabulated water quality monitoring data indicates that the quality of Little River waters is generally good and within the general standards set for Class C waters. No state monitoring information is available to describe the quality of Tank Creek.

Pope AFB discharges all its sanitary sewage to the Fort Bragg Sewage Treatment Plant located north of Manchester Road. The discharge from this plant is monitored by Army personnel from Fort Bragg. Stream data on Little River at State Highway 87 include the discharges from this sewage treatment plant.

Base Water Quality

Surface waters entering and exiting Pope AFB are monitored for water quality by Bioenvironmental Engineering Services on a routine basis. The monitoring locations are shown in Figure 3.10. Monitoring data has been summarized and included in Appendix D.

The monitoring program executed by the base BES suggests that the quality of local surface waters is generally good. Two monitoring


POPE AFB
SURFACE WATER
SAMPLING LOCATIONS
LEGEND
BES SAMPLING POINTS
SOURCE: INSTALLATION DOCUMENTS
Little River
Young Lake
HOUSING AREA
HOUSING AREA
GOLF COURSE
GOLF COURSE
U.S. ARMY
U.S. ARMY
FORT BRAGG WATER FILTRATION PLANT
TAXIWAY
INSTALLATION BOUNDARY
11
902
1
9
650
903
6
SCALE 0 400 800 1200 FEET

points, however, have indicated periodic excursions from acceptable water quality levels. The POL Fuel Storage monitoring point (Point 9 in Figure 3.10) has experienced occasional elevated oil and grease levels ranging from 36 mg/l (June - October 1981) to a high of 804 mg/l (April 1983). These excursions appear to be related to specific fuel spill/ loss incidents.

The second monitoring point at the ditch at Butner Road (Point 1 in Figure 3.10), has experienced periodic elevated levels of phenol. High phenol values were observed on July 1979 (5600 ug/l) and October 1983 (3600 ug/l). In addition, an elevated oil and grease level of 460 mg/l was noted at this monitoring point in March 1979. These water quality excursions appear to be limited to solitary spills or material losses. Since these data reflect water quality entering Pope AFB from Fort Bragg, it is presumed these reflect incidents from the latter Federal installation.

THREATENED AND ENDANGERED SPECIES

There are approximately 354 acres of forest land on Pope AFB. The woodlands are maintained under a forest management program directed by Fort Bragg personnel. The predominant plant species consist of long leaf pine in upland areas and grade into mixed hardwood and shrubs in lowland zones. The base has no unique natural areas. No field crop acreage is maintained on Pope AFB. There are no known threatened or endangered species of plants on base. The only endangered animal species which is reported to be in residence on the Fort Bragg-Pope AFB complex is the Red-Cockaded Woodpecker. This woodpecker has been observed in residence in the northern section of the base near the Fort Bragg sewage treatment plant.

SUMMARY OF ENVIRONMENTAL SETTING

The environmental setting data reviewed for this investigation indicate that the following key items are relevant to the evaluation of past hazardous waste management practices at Pope AFB:

- o The mean annual precipitation for the base is 46.9 inches. the net annual precipitation is calculated to be 4.9 inches, which suggests a moderate infiltration potential. The one year 24-hour rainfall value for the study area is 3.2 inches, which indicates a moderate to high potential for erosion.

- Substantial localized flooding may occur on base as the result of a 100-year storm event.
- Surficial unconsolidated deposits exist for the upper twenty to thirty feet of the installation land surface. These materials have been associated with the Upper Sandy Aquifer in the region. Ground water is present in these materials at shallow depths (six feet or less). Most of the installation is located within the recharge zone of this unit. Discharge from this unit may be directed to local surface waters or to other communicating aquifers. There is no known use of water from this aquifer.
- The region's principal aquifer, the Lower Sandy Aquifer, directly underlies the Upper Sandy Aquifer. The lower unit probably receives recharge from the upper aquifer. The base is located in the recharge zone of this major source of water supply. Spring Lake and adjacent mobile home parks obtain their respective water supplies from the Lower Sandy Aquifer.
- A Bedrock Aquifer underlies the Lower Sandy Aquifer. It is utilized as a source of water by one consumer near the base. Its relationship to overlying units is uncertain and it is assumed that recharge is directed from the overlying unconsolidated aquifers to the bedrock.
- Pope AFB obtains its water supplies from Fort Bragg which utilizes the Little River (just upstream of drainage ditches from the base). Fort Bragg also provides sewage treatment services for the base.
- Some periodic base surface water quality problems have been identified.
- No wetlands have been identified on base.
- No threatened or endangered plant species have been observed on Pope AFB; however, the endangered Red-Cockaded Woodpecker resides in a portion of the base.

From these major points it may be seen that potential pathways for the migration of hazardous waste-related constituents exist. If contamination due to past waste management practices is generated and mobilized, the Upper Sandy Aquifer may be the initial receptor. Contamination present in this aquifer may be directed to local surface waters in baseflow or to the region's principal unit, the Lower Sandy Aquifer in its recharge.

SECTION 4
FINDINGS

This section summarizes the hazardous wastes generated by installation activities, identifies hazardous waste accumulation and disposal sites located on the installation, and evaluates the potential environmental contamination from hazardous waste sites. Past waste generation and disposal methods were reviewed to assess hazardous waste management practices at Pope AFB.

INSTALLATION HAZARDOUS WASTE ACTIVITY REVIEW

A review was made of past and present installation activities that resulted in generation, accumulation and disposal of hazardous wastes. Information was obtained from files and records, interviews with past and present installation employees and site inspections.

The sources of hazardous waste at Pope AFB are grouped into the following categories:

- o Industrial Operations (Shops)
- o Waste Accumulation and Storage Areas
- o Fuels Management
- o Spills and Leaks
- o Pesticide Utilization
- o Fire Protection Training

The subsequent discussion addresses only those wastes generated at Pope AFB which are either hazardous or potentially hazardous. Potentially hazardous wastes are grouped with and referenced as "hazardous wastes" throughout this report. A hazardous waste, for this report, is defined by, but not limited to, the Comprehensive Environmental Response, Compensation and Liability Act of 1980 (CERCLA). For study purposes, waste petroleum products such as contaminated fuels, waste oils and waste solvents are also included in the "hazardous waste" category.

No distinction is made in this report between "hazardous substances/materials" and "hazardous wastes". A potentially hazardous waste is one which is suspected of being hazardous although insufficient data are available to fully characterize the material.

Industrial Operations (Shops)

Summaries of industrial operations at Pope AFB were developed from installation files and interviews. Information obtained was used to determine which operations handle hazardous materials and which ones generate hazardous wastes. Summary information on all installation shops is provided as Appendix E, Master List of Industrial Shops.

For the shops identified as generating hazardous wastes, file data was reviewed and personnel were interviewed to determine the types and quantities of materials and present and past disposal methods. Information developed from Pope AFB files and interviews with installation employees is summarized in Table 4.1.

Table 4.1 presents information on shop location, identification of hazardous or potentially hazardous waste, present waste quantities, and waste management timelines for Pope AFB. The waste quantities reflect present conditions. The waste types and quantities probably have not changed much over time, however, the disposal methods have varied depending on waste usage and base policy regarding the disposal of waste.

Industrial operations at Pope AFB were grouped into eleven main units:

317 Avionics Maintenance Squadron

317 Field Maintenance Squadron

317 Organizational Maintenance Squadron

317 Civil Engineering Squadron

317 Transportation Squadron

USAF Clinic

Morale Welfare Recreation Division

3 Mobile Aerial Port Squadron

Operations and Training Division

TABLE 4.1
INDUSTRIAL OPERATIONS (Shops)
Waste Management

SHOP NAME	LOCATION (BLDG. NO.)	WASTE MATERIAL	WASTE QUANTITY	METHOD(S) OF TREATMENT, STORAGE & DISPOSAL (1950 – 1960 – 1970 – 1980)
317 AVIONICS MAINTENANCE SQUADRON				
ELECTRIC SHOP	731	BATTERY ACID	240 GALS./YR.	1972 NEUTRALIZED/ SANITARY SEWER
		PD 680	30 GALS./YR.	SANITARY SEWER; 1975 FT. BRAGG DPDO
		LEAD BATTERIES	40 BATTERIES/YR.	FT. BRAGG DPDO
		Ni/Cd BATTERIES	6 BATTERIES/YR.	FT. BRAGG DPDO
		POTASSIUM HYDROXIDE	3 GALS./YR.	NEUTRALIZED/ SANITARY SEWER
		NON PCB WASTE OIL	*20 GALS./YR.*	FT. BRAGG DPDO/ HEATING PLANT
PMEL	739	MERCURY	16.6 LBS./YR.	1965 RECLAIMED BY FT. BRAGG
		VACUUM PUMP OIL	2 GALS./YR.	FPTA; 1975 FT. BRAGG DPDO/HEATING PLANT
317 FIELD MAINTENANCE SQUADRON				
FUEL SYSTEMS REPAIR	734, 735, 736	WASTE OIL	12 GALS./YR.	1958 FPTA; 1975 FT. BRAGG DPDO/HEATING PLANT
		JP 4	600 GALS./YR.	FPTA; 1974 FPTA/ RECYCLED
PNEUDRAULICS SHOP	731	PD 680	360 GALS./YR.	1972 FT. BRAGG DPDO/HEATING PLANT
		HYDRAULIC FLUID	110 GALS./YR.	FT. BRAGG HEATING PLANT
AR SHOP	712	HYDRAULIC FLUID	20 GALS./YR.	1956 FPTA; 1975 FT. BRAGG HEATING PLANT

KEY

——— CONFIRMED TIME-FRAME DATA BY SHOP PERSONNEL

- - - - - - ESTIMATED TIME-FRAME DATA BY SHOP PERSONNEL

FPTA FIRE PROTECTION TRAINING AREA

DPDO DEFENSE PROPERTY DISPOSAL OFFICE

TABLE 4.1 (CONT'D)

INDUSTRIAL OPERATIONS (Shops)

Waste Management

SHOP NAME	LOCATION (BLDG. NO.)	WASTE MATERIAL	WASTE QUANTITY	METHOD(S) OF TREATMENT, STORAGE & DISPOSAL (1950 – 1960 – 1970 – 1980)
WASH RACK	712	PAINT STRIPPER	300 400 GALS./YR.	1958 SANITARY SEWER 1975
		AIRCRAFT CLEANER	300 GALS./YR.	SANITARY SEWER
		PD-680	200 GALS./YR.	SANITARY SEWER
CORROSION CONTROL	731	METHYL ETHYL KETONE	420 GALS./YR.	1972 FT. BRAGG DPDO
		LACQUER THINNER	110 GALS./YR.	FPTA 1975 FT. BRAGG DPDO
		WASTE PAINTS AND POLYURETHANE	470 GALS./YR.	FT. BRAGG DPDO
NDI/SOAP LAB	731	DEVELOPER	120 GALS./YR.	FT. BRAGG DPDO
		INDUSTRIAL FIXER	40 50 GALS./YR.	TO FT. BRAGG FOR SILVER RECOVERY
		EMULSIFIER	60 GALS./YR.	FT. BRAGG DPDO
		PENETRANT	90 GALS./YR.	FT. BRAGG DPDO
AEROSPACE GROUND EQUIPMENT (AGE)	723	PD-680	240 GALS./YR.	1960 FT. BRAGG DPDO/HEATING PLANT
AGE SERVICING	759	WASTE OILS	1,000 GALS./YR.	1962 FT. BRAGG DPDO/HEATING PLANT

KEY

——— CONFIRMED TIME-FRAME DATA BY SHOP PERSONNEL

- - - - - - ESTIMATED TIME-FRAME DATA BY SHOP PERSONNEL

FPTA FIRE PROTECTION TRAINING AREA

DPDO DEFENSE PROPERTY DISPOSAL OFFICE

TABLE 4.1 (CONT'D)

INDUSTRIAL OPERATIONS (Shops)

Waste Management

SHOP NAME	LOCATION (BLDG. NO.)	WASTE MATERIAL	WASTE QUANTITY	METHOD(S) OF TREATMENT, STORAGE & DISPOSAL 1950 1960 1970 1980
ENGINE SHOP/DISPATCH/SUPPLY	715	PD 680	200 GALS./YR.	1965 FT. BRAGG DPDO /HEATING PLANT
		AIRCRAFT SOAP	300 350 GALS./YR.	SANITARY SEWER
		LUBE OIL	1,200 GALS./YR.	FT. BRAGG DPDO/HEATING PLANT
		HYDRAULIC FLUID	60 GALS./YR.	FT. BRAGG DPDO/HEATING PLANT
GTC SECTION	715	PD 680	110 GALS./YR.	SANITARY SEWER; 1975 FT. BRAGG HEATING PLANT
PROPELLER SHOP	715	PD-680	260 GALS./YR.	SANITARY SEWER; FT. BRAGG HEATING PLANT
TEST CELL	792	PD-680	260 GALS./YR.	FT. BRAGG HEATING PLANT
		HYDRAULIC FLUID	50 GALS./YR.	FT. BRAGG HEATING PLANT
		WASTE OIL	80 100 GALS./YR.	FT. BRAGG DPDO/HEATING PLANT
		AIRCRAFT SOAP	600 GALS./YR.	1982 SANITARY SEWER

KEY

——— CONFIRMED TIME-FRAME DATA BY SHOP PERSONNEL

- - - - - - ESTIMATED TIME-FRAME DATA BY SHOP PERSONNEL

FPTA - FIRE PROTECTION TRAINING AREA

DPDO - DEFENSE PROPERTY DISPOSAL OFFICE

TABLE 4.1 (CONT'D)

INDUSTRIAL OPERATIONS (Shops)

Waste Management

SHOP NAME	LOCATION (BLDG. NO.)	WASTE MATERIAL	WASTE QUANTITY	METHOD(S) OF TREATMENT, STORAGE & DISPOSAL (1950–1980)
WHEEL AND TIRE SHOP	712	PD-680	400 GALS./YR.	1956 SANITARY SEWER (estimated) → 1975 FT. BRAGG DPDO/HEATING PLANT (confirmed)
		PAINT STRIPPER AND DEGREASER	1,000 GALS./YR.	FPTA (estimated) → FT. BRAGG DPDO (confirmed)
317 ORGANIZATIONAL MAINTENANCE SQUADRON				
WASH RACK	745, 760	PD-680	1,500 GALS./YR.	1975 SANITARY SEWER/FT. BRAGG HEATING PLANT (confirmed)
		AIRCRAFT SOAP	1,200 1,500 GALS./YR.	SANITARY SEWER/FT. BRAGG HEATING PLANT (confirmed)
NON-POWERED AGE	755	ENGINE OIL	3,000 GALS./YR.	1962 FPTA (estimated) → FT. BRAGG DPDO/HEATING PLANT (confirmed)
		HYDRAULIC FLUID	1,000 GALS./YR.	FPTA (estimated) → FT. BRAGG DPDO/HEATING PLANT (confirmed)
TRANSIENT SUPPORT BRANCH	754	ABSORBENT PADS WITH JP-4	52 PADS/YR.	FPTA
INSPECTION BRANCH	722	HYDRAULIC FLUID	360 GALS./YR.	1958 FPTA (estimated) → 1975 FPTA/FT. BRAGG HEATING PLANT (confirmed)
		WASTE OILS	480 GALS./YR.	(estimated) → FT. BRAGG DPDO/HEATING PLANT (confirmed)
		PD-680	250 300 GALS./YR.	(estimated) → FT. BRAGG DPDO (confirmed) 1983
		PD-680	110 GALS./YR.	FT. BRAGG HEATING PLANT
		GAS PATH SOAP (SOLVENT)	52 GALS./YR.	1958 SANITARY SEWER (estimated) → 1975 FT. BRAGG DPDO (confirmed)

KEY

——— CONFIRMED TIME-FRAME DATA BY SHOP PERSONNEL

- - - - - ESTIMATED TIME-FRAME DATA BY SHOP PERSONNEL

FPTA FIRE PROTECTION TRAINING AREA

DPDO - DEFENSE PROPERTY DISPOSAL OFFICE

TABLE 4.1 (CONT'D)

INDUSTRIAL OPERATIONS (Shops)

Waste Management

SHOP NAME	LOCATION (BLDG. NO.)	WASTE MATERIAL	WASTE QUANTITY	METHOD(S) OF TREATMENT, STORAGE & DISPOSAL (1950 1960 1970 1980)
OPERATIONS AND TRAINING DIVISION				
PHOTO LAB	744	PHOTOGRAPHIC WASTES		
		FIXER	388 GALS./YR.	1962 SILVER RECOVERY/ SANITARY SEWER
		DEVELOPER	260 GALS./YR.	SANITARY SEWER
317 CIVIL ENGINEERING SQUADRON				
ELECTRIC SHOP	617	BATTERY ACIDS	25 GALS./YR.	1963 NEUTRALIZED/ SANITARY SEWER
ROADS/GROUNDS	617	WASTE OILS	200 GALS./YR.	FPTA 1975 FT. BRAGG DPDO/HEATING PLANT
ENTOMOLOGY	600	WASTE CONTAINERS/CANS (TRIPLE RINSED)	60 CONTAINERS/YR.	FT. BRAGG LANDFILL
PAINT SHOP	606	WASTE THINNERS	25-30 GALS./YR.	1942 FPTA 1980
		WASTE THINNERS	5 GALS./YR.	FT. BRAGG DPDO
		WASTE PAINTS	10 GALS./YR.	FT. BRAGG LANDFILL
REFRIGERATION SHOP	606	DILUTE ACID CLEANING SOLUTION	100 GALS./YR.	1942 SANITARY SEWER
		EVAPORATOR SOLUTION	100 GALS./YR.	SANITARY SEWER
		WASTE OILS	50 GALS./YR.	FPTA FT. BRAGG DPDO/HEATING PLANT

KEY

——— CONFIRMED TIME-FRAME DATA BY SHOP PERSONNEL

- - - - - ESTIMATED TIME-FRAME DATA BY SHOP PERSONNEL

FPTA - FIRE PROTECTION TRAINING AREA

DPDO - DEFENSE PROPERTY DISPOSAL OFFICE

TABLE 4.1 (CONT'D)

INDUSTRIAL OPERATIONS (Shops)

Waste Management

SHOP NAME	LOCATION (BLDG. NO.)	WASTE MATERIAL	WASTE QUANTITY	METHOD(S) OF TREATMENT, STORAGE & DISPOSAL 1950 1960 1970 1980
FUELS MAINTENANCE	606	FUEL TANK SLUDGE	40 GALS./YR.	BURIED NEAR POL STORAGE TANKS — FT. BRAGG DPDO — OBCR
POWER PRODUCTION	625	SULFURIC ACID	72 GALS./YR.	NEUTRALIZED/SANITARY SEWER
WASH RACK	625	PD-680	10 GALS./YR.	SANITARY SEWER 1981
317 TRANSPORTATION SQUADRON				
VEHICLE MAINTENANCE	454	PD-680	100 GALS./YR.	1956 FPTA 1975 FT. BRAGG DPDO
		AIRCRAFT SOAP	150 GALS./YR.	SANITARY SEWER
		WASTE OILS	1,000 GALS./YR.	FPTA 1974 FT. BRAGG DPDO/HEATING PLANT
		BATTERY ACIDS	100 150 GALS./YR.	NEUTRALIZED/SANITARY SEWER
ALLIED TRADES	454	WASTE THINNER AND PAINT	180 GALS./YR.	FPTA 1975 FT. BRAGG DPDO
QUALITY CONTROL	454	BATTERY ACID	1,500 GALS./YR.	NEUTRALIZED/SANITARY SEWER
		ANTIFREEZE	660 GALS./YR.	SANITARY SEWER
REFUELING MAINTENANCE	150	JP 4	200 GALS./YR.	1963 FT. BRAGG FPTA/ HEATING PLANT
		WASTE OIL	600 GALS./YR.	FPTA 1975 FT. BRAGG DPDO/HEATING PLANT
		AIRCRAFT SOAP	300 GALS./YR.	SANITARY SEWER

KEY

——— CONFIRMED TIME-FRAME DATA BY SHOP PERSONNEL

- - - - - - ESTIMATED TIME-FRAME DATA BY SHOP PERSONNEL

FPTA FIRE PROTECTION TRAINING AREA

DPDO DEFENSE PROPERTY DISPOSAL OFFICE

OBCR - OFF-BASE CONTRACT REMOVAL

TABLE 4.1 (CONT'D)

INDUSTRIAL OPERATIONS (Shops)

Waste Management

SHOP NAME	LOCATION (BLDG. NO.)	WASTE MATERIAL	WASTE QUANTITY	METHOD(S) OF TREATMENT, STORAGE & DISPOSAL (1950 – 1960 – 1970 – 1980)
FIRE DEPARTMENT MAINTENANCE	250	WASTE OILS	150 GALS./YR.	1956 FPTA - - - → FT. BRAGG DPDO/HEATING PLANT - - - →
		TRANSMISSION FLUID	25 GALS./YR.	FPTA - - - → FT. BRAGG HEATING PLANT - - - →
		ANTIFREEZE	200 GALS./YR.	SANITARY SEWER - - - → 1974 FT. BRAGG HEATING PLANT - - - →
USAF CLINIC				
CLINIC LAB/X RAY	307	FIXER	60 GALS./YR.	1971 SILVER RECOVERY/ SANITARY SEWER ——→
		DEVELOPER	60 GALS./YR.	SANITARY SEWER ——→
X-RAY	260	DEVELOPER	52 GALS./YR.	SANITARY SEWER ——→
		FIXER	52 GALS./YR.	SILVER RECOVERY/ SANITARY SEWER ——→
DENTAL CLINIC/LAB	260	MERCURY	9 GMS/YR.	TO FT. BRAGG FOR RECLAMATION - - - →
MORALE WELFARE RECREATION DIVISION				
AUTO HOBBY SHOP	390	PD-680	96 GALS./YR.	1965 SANITARY SEWER - - - → 1975 FT. BRAGG HEATING PLANT ——→
		WASTE OIL	1,500 GALS./YR.	FT. BRAGG HEATING PLANT ——→

KEY

——— CONFIRMED TIME-FRAME DATA BY SHOP PERSONNEL

- - - - - ESTIMATED TIME-FRAME DATA BY SHOP PERSONNEL

FPTA FIRE PROTECTION TRAINING AREA

DPDO DEFENSE PROPERTY DISPOSAL OFFICE

TABLE 4.1 (CONT'D)

INDUSTRIAL OPERATIONS (Shops)

Waste Management

SHOP NAME	LOCATION (BLDG. NO.)	WASTE MATERIAL	WASTE QUANTITY	METHOD(S) OF TREATMENT, STORAGE & DISPOSAL (1950 1960 1970 1980)
3 MOBILE AERIAL PORT SQUADRON				
VEHICLE OPERATIONS AND MAINTENANCE	764, 766	AIRCRAFT CLEANING COMPOUND	150 GALS./YR.	1966 SANITARY SEWER 1982
		AIRCRAFT CLEANING COMPOUND	50 GALS./YR.	SANITARY SEWER
		ENGINE OIL	100 GALS./YR.	FPTA
		ANTIFREEZE	200 GALS./YR.	SANITARY SEWER
		CONTAMINATED GASOLINE	300 GALS./YR.	FPTA
		BATTERY ACID	100 GALS./YR.	NEUTRALIZED/ SANITARY SEWER
317 SUPPLY SQUADRON				
FUELS LAB	162	POTASSIUM DICHROMATE/ SULFURIC ACID	15 GALS./YR.	1969 NEUTRALIZED/ SANITARY SEWER
		JP 4	1,680 GALS./YR.	RECYCLED/FPTA 1982
		JP-4	300 GALS./YR.	FPTA

KEY

——— CONFIRMED TIME-FRAME DATA BY SHOP PERSONNEL

- - - - - ESTIMATED TIME-FRAME DATA BY SHOP PERSONNEL

FPTA - FIRE PROTECTION TRAINING AREA

DPDO DEFENSE PROPERTY DISPOSAL OFFICE

TABLE 4.1 (CONT'D)

INDUSTRIAL OPERATIONS (Shops)

Waste Management

SHOP NAME	LOCATION (BLDG. NO.)	WASTE MATERIAL	WASTE QUANTITY	METHOD(S) OF TREATMENT, STORAGE & DISPOSAL (1950 1960 1970 1980)
A. CO. 82ND AVIATION BRANCH	738	AIRCRAFT CLEANING COMPOUND	400 GALS./YR.	1956 SANITARY SEWER
		POTASSIUM HYDROXIDE	4 GALS./YR.	SANITARY SEWER 1982
		HYDRAULIC FLUID	120 GALS./YR.	FT. BRAGG DPDO/HEATING PLANT
		ENGINE OIL	1,200 GALS./YR.	FT. BRAGG DPDO/HEATING PLANT
B. CO. 82ND AVIATION DIVISION				
AIRCRAFT MAINTENANCE	726	HYDRAULIC FLUID	100 120 GALS./YR.	1958 FPTA; FT. BRAGG HEATING PLANT
		WASTE OILS	180 240 GALS./YR.	FPTA; 1974 FT. BRAGG HEATING PLANT
		METHYL ETHYL KETONE	12 GALS./YR.	SANITARY SEWER; FT. BRAGG DPDO
		AIRCRAFT SURFACE CLEANER	660 GALS./YR.	SANITARY SEWER
		PD-680	600 GALS./YR.	OIL WATER SEPARATOR/STORM SEWER
		JP-4	20 30 GALS./YR.	FPTA; 1974 FT. BRAGG HEATING PLANT
1943RD INFORMATION SYSTEMS SQUADRON				
CONSOLIDATED MAINTENANCE	137	ELECTRON TUBES	36 TUBES/YR.	FT. BRAGG DPDO
WEATHER MAINTENANCE	817	ELECTRON TUBES	48 TUBES/YR.	1974 FT. BRAGG DPDO

KEY

———— CONFIRMED TIME-FRAME DATA BY SHOP PERSONNEL

- - - - - - ESTIMATED TIME-FRAME DATA BY SHOP PERSONNEL

FPTA FIRE PROTECTION TRAINING AREA

DPDO DEFENSE PROPERTY DISPOSAL OFFICE

TABLE 4.1 (CONT'D)

INDUSTRIAL OPERATIONS (Shops)

Waste Management

SHOP NAME	LOCATION (BLDG. NO.)	WASTE MATERIAL	WASTE QUANTITY	METHOD(S) OF TREATMENT, STORAGE & DISPOSAL (1950 1960 1970 1980)
MISCELLANEOUS				
BX STATION	400	WASTE OILS	2,300 GALS./YR.	1960 — CONTRACT DISPOSAL (estimated) →
		ANTIFREEZE	180 240 GALS./YR.	1960 — SANITARY SEWER (estimated) →
		BRAKE FLUID/TRANSMISSION FLUID	300 GALS./YR.	1960 — CONTRACT DISPOSAL (estimated) →
BASE REPROGRAPHICS	306	ELECTROSTATIC SOLUTION	8 GALS./YR.	1945 — SANITARY SEWER (estimated) →

KEY

——— CONFIPMED TIME-FRAME DATA BY SHOP PERSONNEL

- - - - - ESTIMATED TIME-FRAME DATA BY SHOP PERSONNEL

FPTA FIRE PROTECTION TRAINING AREA

DPDO DEFENSE PROPERTY DISPOSAL OFFICE

82nd Aviation Division

1943rd Information Systems Squadron

Most shops began operations in the period from the late 1950's to the early 1960's. Records were not maintained until the late 1970's regarding hazardous waste generation and disposal practices. However, interviews with military and civilian personnel were performed and this information was used to develop the information in the timelines in Table 4.1.

The waste generated in the shops at Pope AFB consist of waste oils, fuels, cleaning solutions, acids and bases, photographic solutions and solvents. Hazardous wastes generated at Pope AFB have been disposed of by several different methods. The following is an overview of the methods used for handling shop wastes.

Up until the early 1970's most combustible waste materials were disposed at Fire Protection Training Areas (FPTA). Noncombustible wastes were disposed to the sanitary sewer system and solid waste was taken to Fort Bragg landfills. Wastes that have been disposed to the sanitary sewer system have been neutralized acids or bases, cleaning solutions, and photographic wastes.

Since 1974, waste fuels and oils have been used by Fort Bragg in their heating plant. Fort Bragg collects the waste from the underground storage tanks and from the oil/water separators. The majority of waste aircraft fuel (JP-4) has been recycled and reused by liquid fuels management. The aircraft fuel that is not reusable by liquid fuels management is stored in a tank near the present FPTA and eventually burned there.

Since the mid-1970's, waste solvents, strippers, cleaning solutions, and thinners have been disposed of through the Fort Bragg DPDO. The waste is placed in drums, taken to the accumulation points and then picked up and disposed by Fort Bragg DPDO. Solid wastes are currently disposed off base by a contractor. In the past, solid waste was picked up by Fort Bragg personnel and disposed in a Fort Bragg landfill.

Fort Bragg maintains and services all but three transformers at Pope AFB. The three transformers maintained by Pope AFB do not contain PCB transformer oil. No out-of-service PCB transformers have been stored on the base and no PCB spills have been reported to have occurred at the installation.

Waste Accumulation and Storage Areas

Hazardous wastes are temporarily stored in satellite accumulation areas located at Buildings 712, 731, 346 and Facility 41115. The wastes are stored in these areas for less than 90 days prior to being picked up by Fort Bragg DPDO for disposal. The locations of these temporary storage facilities are shown in Figure 4.1. In the past, Facility 41115 was used as a hazardous waste storage facility. The waste stored in the facility is stored in 55-gallon drums and in underground tanks. The underground tanks are used to store waste petroleum products and include a 10,000 gallon tank for mineral-based oil, a 10,000 gallon tank for synthetic engine oil, and a 2,000 gallon tank for JP-4. The facility has an asphalt floor and curb for containment and also is fenced to prohibit entry.

The Fort Bragg DPDO accepts all drums of hazardous waste and also pumps out waste petroleum products from the storage tanks. The drums of hazardous wastes are disposed off-site by contract through DPDO. The waste petroleum products are burned in the Fort Bragg heating plant.

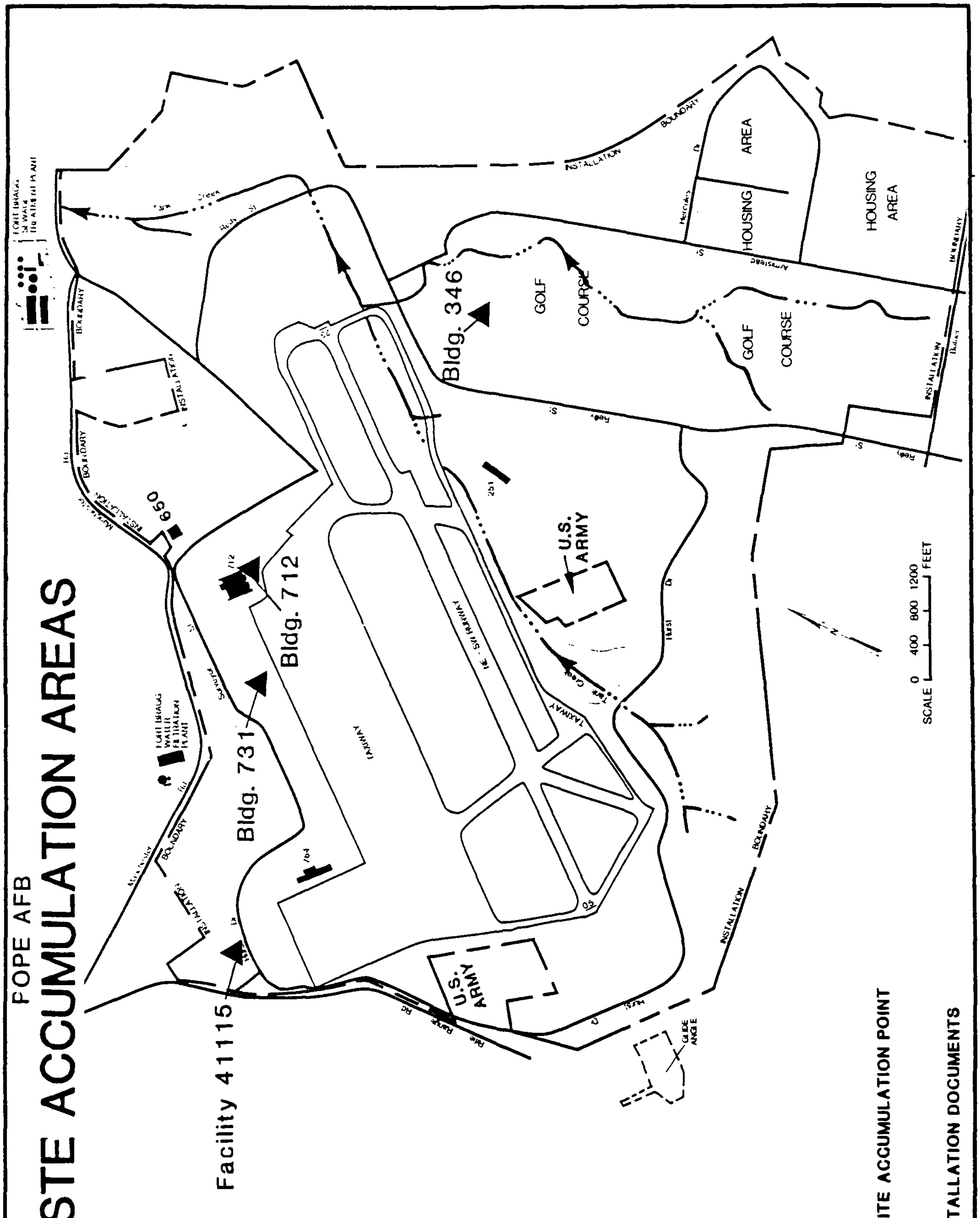
There have been some small spills and leaks in the waste accumulation areas which are detailed in the spills and leaks section. The containment structure at the storage Facility 41115 has allowed efficient cleanup of any small leaks or spills which may have occurred in the past.

Fuels Management

The Pope AFB fuels management system includes JP-4 jet fuel, No. 2 fuel oil, diesel fuel, motor vehicle fuel (MOGAS). A listing of all petroleum storage facilities at the base can be found in Table D.1 (Appendix D).

Jet fuels are received by rail car into one of three bulk storage tanks. Two of the storage tanks have a total capacity of 840,000 gallons and the third has a total capacity of 420,000 gallons. Four receiving pumps rated at 250 gpm pump the fuel into these tanks. The fuel is transferred to the flightline storage tanks through an underground transfer line by four transfer pumps rated at 300 gpm.

FIGURE 4.1



ES ENGINEERING-SCIENCE

There are three pump stations used to transfer fuel from flightline storage tanks into an underground refueling hydrant system. Each pump station system includes six-50,000 gallon below grade hydrant storage tanks and one-2,000 gallon waste fuel collection tank.

The waste fuel collection tanks at each pump station are used to collect fuels from leaks, automatic filter drains and floor drains. These fuels are tested by the fuels lab and if found to be uncontaminated are reused by liquid fuels management. Contaminated fuels are either burned in the FPTA or used as a fuel in the Fort Bragg heating plant.

The bulk storage fuel tanks are leak tested annually and are inspected internally by CE Liquid Fuels every 5-7 years. The hydrant storage tanks are leak tested annually and inspected internally by CE Liquid Fuels every three years. They have been cleaned out on the average of every six years. Cleanouts yield approximately 10 gallons of sludge per tank. Cleanouts of the bulk storage tanks have typically yielded about 20 gallons of sludge per tank.

In the early 1950's, an interviewee noted the sludge from the storage tanks was disposed in an area east of Fire Protection Training Area (FPTA) No. 4 (discussed later). From the mid-1950's until 1975, the sludge was disposed in an area east of the bulk storage tanks. Since 1975, the sludge has been disposed off-base.

Photographs of the bulk storage area and POL tank sludge disposal area are in Appendix F.

Spills and Leaks

A number of small spills and leaks have occurred at Pope AFB. Most of the spills and leaks have been quantities less than 100 gallons and have been JP-4 fuel. They have occurred mainly on the flightline and the POL bulk storage and unloading area. Most flightline spills have occurred onto paved areas which have been contained and cleaned up with absorbent materials. Thus, the minor spills have posed no threat to environmental contamination.

In the 1960's, at the refueling maintenance area (Building 150), a spill from a refueling truck resulted in a loss of 200 to 400 gallons of fuel. The fuel was washed into the surface drainage system which eventually leads to Tank Creek and Little River.

A major spill occurred on the flightline in the 1960's. Several thousand gallons of JP-4 were lost during a transfer operation. The fuel migrated to the storm sewers, but was contained at the drainage gates. Some of the fuel was recovered and some infiltrated the ground.

In the mid 1970's, a leak of about 400-500 gallons of JP-4 occurred in the pipeline which runs from the POL bulk storage area to the hydrant fuel storage area. The fuel migrated to the surrounding drainage ditches, but most of the fuel was recovered using absorbent materials.

A spill of JP-4 occurred in the late 1970's during the unloading of a railroad car. Approximately 3,000 gallons of JP-4 was spilled which migrated to adjacent drainage ditches. The fuel spill was contained and most of the fuel was recovered.

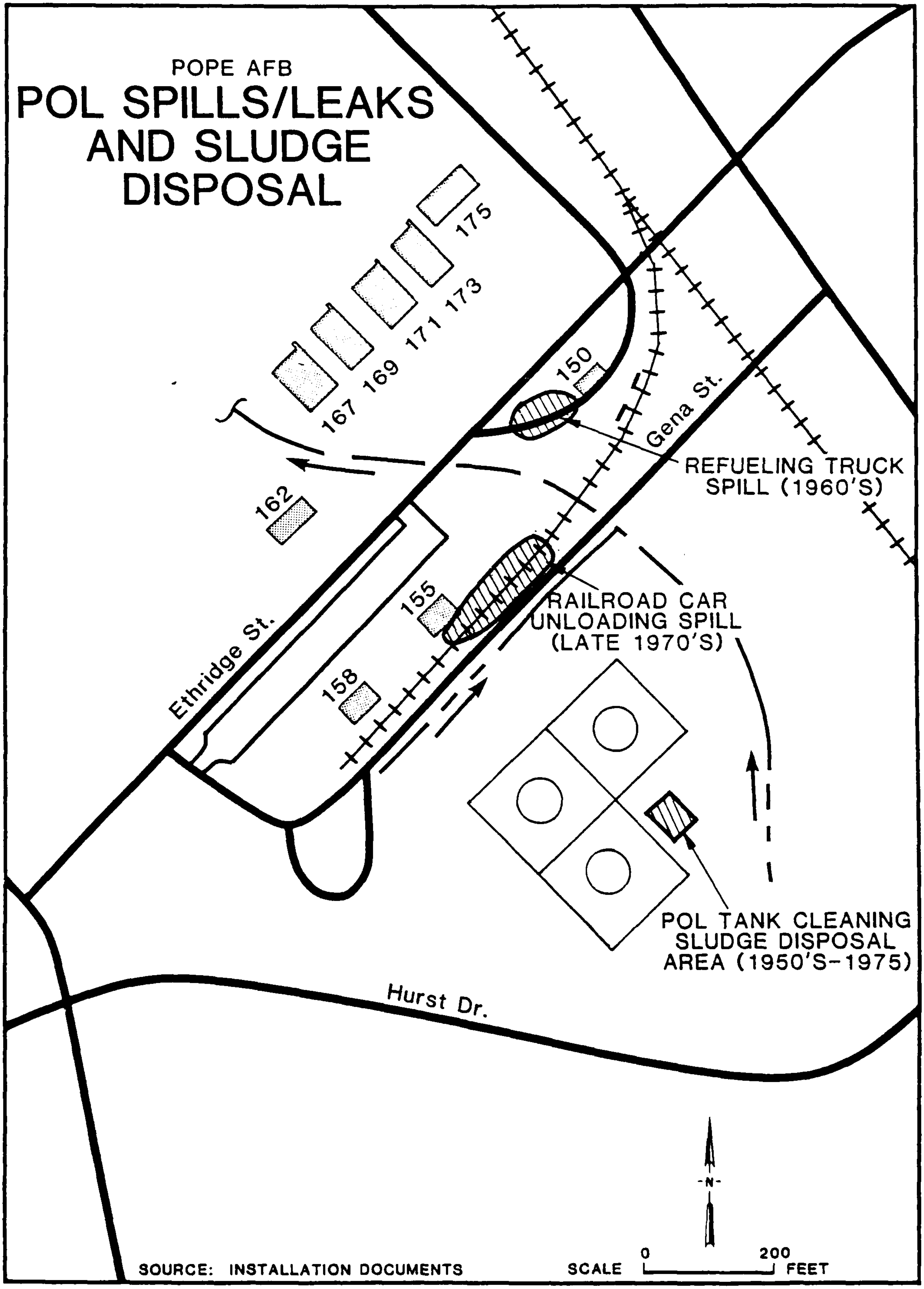
Numerous small spills (less than 100 gallons) have occurred near the POL bulk storage tanks. The spills area is shown in Figure 4.2. Two years ago, about 100 gallons of JP-4 was spilled when the tanks were overloaded. Since the storage area is diked on its sides, the fuel was contained and cleaned up. However, the base of the containment structure is a gravel surface. It is assumed that when spills occur in the diked area, some fuel infiltrates into the ground.

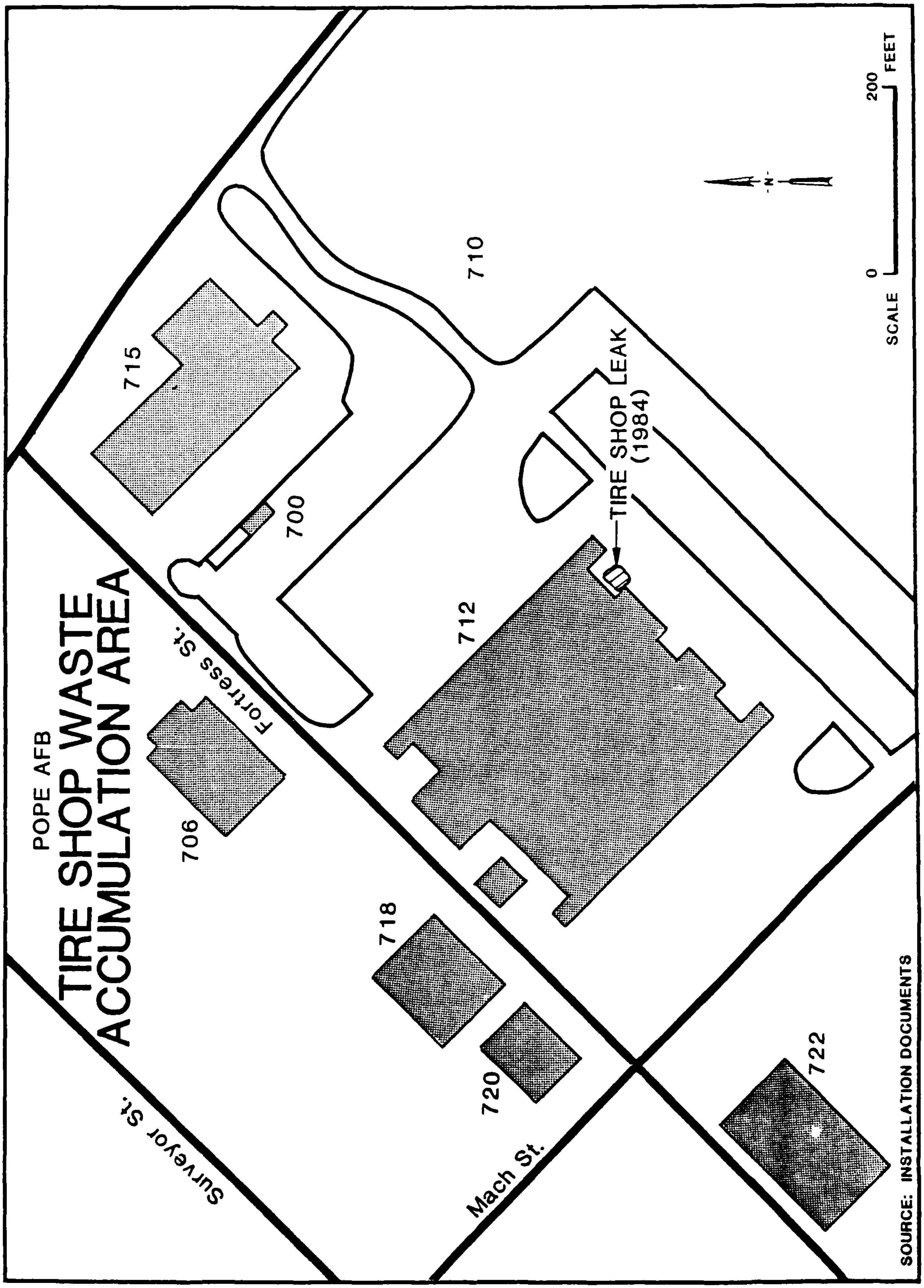
Spills and leaks have also occurred near the waste accumulation area behind the Tire Shop (Building 712). The Tire Shop area is shown in Figure 4.3 and a photograph is in Appendix F. The Tire Shop strips and cleans wheels as a part of their shop operation. A tank in the shop contains stripper which is used in the stripping process. Spent stripper, when removed from the tank, is placed into 55-gallon drums. The transfer process into 55-gallon drums has resulted in a number of small spills, some of which have migrated onto the ground outside the shop. In July of 1984, at the Tire Shop waste accumulation storage area, a leak occurred involving paint stripper. At least one (and possibly more) 55-gallon drum(s) leaked paint stripper onto the ground. The leaking drum(s) was removed and disposed. Sampling and analysis of the soil in the area has shown contamination with high levels of hydrocarbons.

<u>Pesticide Utilization</u>

A number of pesticides have been used at Pope AFB. The pesticides

FIGURE 4.2


POPE AFB
POL SPILLS/LEAKS AND SLUDGE DISPOSAL
175
173
171
169
167
150
162
155
158
Gena St.
Ethridge St.
Hurst Dr.
REFUELING TRUCK SPILL (1960'S)
RAILROAD CAR UNLOADING SPILL (LATE 1970'S)
POL TANK CLEANING SLUDGE DISPOSAL AREA (1950'S-1975)
N
SOURCE: INSTALLATION DOCUMENTS
SCALE
0
200
FEET


POPE AFB
TIRE SHOP WASTE
ACCUMULATION AREA
Surveyor St.
Mach St.
Fortress St.
706
718
720
722
700
715
712
710
TIRE SHOP LEAK
(1984)
N
SCALE
0
200
FEET
SOURCE: INSTALLATION DOCUMENTS

are used by entomology, pavement and grounds, and golf course personnel. Appendix D (Table D.3) summarizes the pesticides currently used.

Building 600 is used for storing pesticides used on base. Mixing of pesticides is predominantly done at the Civil Engineering (CE) washrack (south of Building 625) but some mixing takes place at field locations including the golf course (Facility Yard 462).

Pesticide containers have been triple rinsed since the mid 1970's. Waste containers (cans) and bags are placed in dumpsters for landfill disposal. Container rinsewaters are used for dilution water or sprayed out on the grounds. Similarly, water used for cleaning the sprayers is usually either reused for dilution water or sprayed randomly on the base. Sometimes the sprayers are rinsed at the CE washrack which drains to the sanitary sewer.

Fire Protection Training

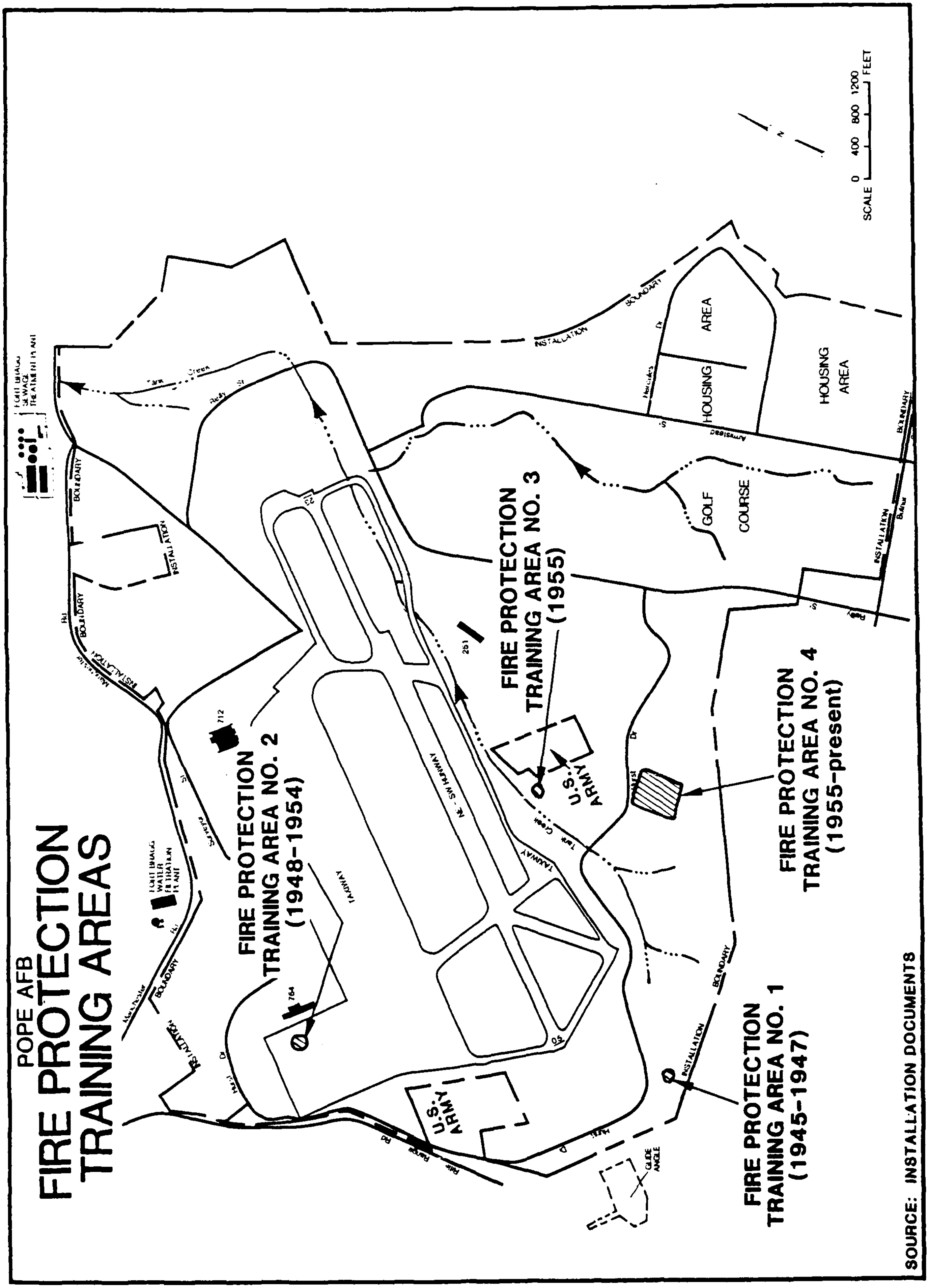
Four different areas have been reported as being used to conduct training activities for Pope AFB firemen (Figure 4.4). The first three were used for short periods while the last and currently operating facility has been in existence for a number of years. Appendix F has photographs of the present training site.

Fire Protection Training Area No. 1

The first area to be used for fire training was a site at the southwest corner of the base. This facility operated for only a couple of years (1945-1947). About every two to four weeks a fire was initiated for training fire protection personnel. AVGAS and some shop wastes were burned. About 200-300 gallons were poured on the ground for each fire. Water was applied prior to combustion. There is no evidence of this old fire protection training area at the base, probably due to the short period of operation and the highly eroded soil in the area.

Fire Protection Training Area No. 2

Fire Protection Training Area (FPTA) No. 2 operated for approximately five to six years (1948-1954). This site was located just off the old northwest-southeast (NW-SE) runway which existed at Pope AFB. The frequency of fires and quantity of fuel used was comparable to FPTA No. 1. During the time this site operated, JP-4 began to be burned along with AVGAS and some shop wastes. Water was applied prior to pouring fuel on the ground. The area where this site existed is


POPE AFB
FIRE PROTECTION
TRAINING AREAS
FIRE PROTECTION
TRAINING AREA NO. 1
(1945-1947)
FIRE PROTECTION
TRAINING AREA NO. 2
(1948-1954)
FIRE PROTECTION
TRAINING AREA NO. 3
(1955)
FIRE PROTECTION
TRAINING AREA NO. 4
(1955-present)
U.S. ARMY
U.S. ARMY
GOLF
COURSE
HOUSING
AREA
HOUSING
AREA
INSTALLATION
BOUNDARY
TAXIWAY
NE - SW RUNWAY
FORT BRAGG SEWAGE TREATMENT PLANT
FORT BRAGG WATER FILTRATION PLANT
GLIDE ANGLE
712
764
261
SCALE
0 400 800 1200 FEET
N
SOURCE: INSTALLATION DOCUMENTS

believed to be under the existing concrete aircraft apron near Buildng 764. This site was abandoned during the runway reconstruction project which began in the mid 1950's.

Fire Protection Training Area No. 3

FPTA No. 3 operated for a very short time during 1955. This site is located south of the runway near Tank Creek (Figure 4.4). The site appears to be close to the existing static airplane display in this vicinity. Waste fuels and other shop wastes were poured on the ground after water was applied. Fuels used for combustion were comparable to FPTA No. 2. The frequency of fires began to increase at this site compared with FPTA Nos. 1 and 2 (estimated two to four per week).

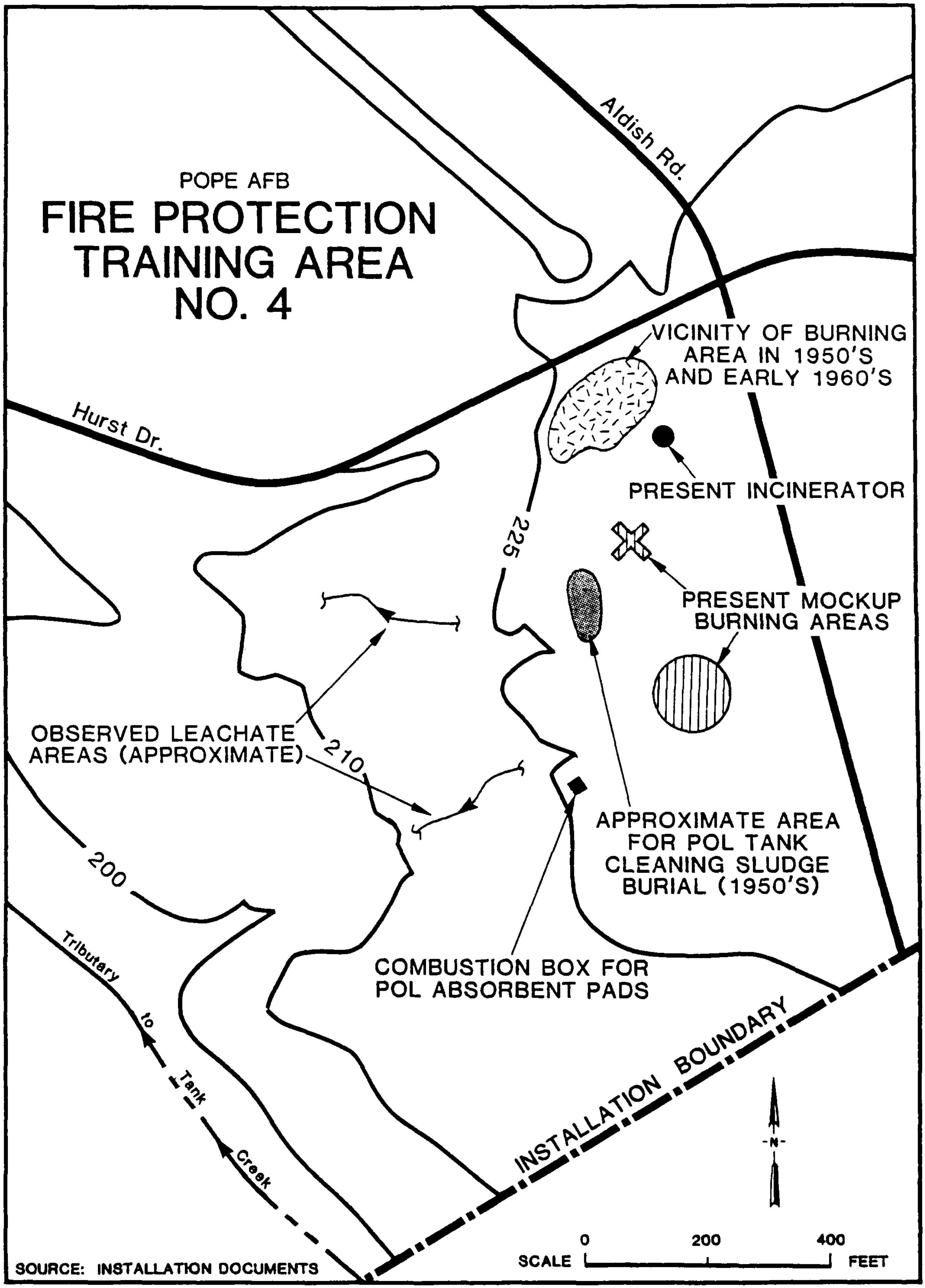
Fire Protection Training Area No. 4

Concurrent with the fire pit operations at FPTA No. 3 was an aircraft mockup burning area which operated at the north end, possibly where Hurst Drive now exists, of the area designated as FPTA No. 4 (Figure 4.5). This mockup burning facility was used only a short time until the two present burning sites at FPTA No. 4 began to operate. FPTA No. 4 has been utilized since 1955 for fire training purposes.

The smaller fire pit which now exists at FPTA No. 4 has concrete side walls and a concrete bottom. The larger fire pit does not have any type of concrete containment; no underdrains or collection systems are provided. Waste fuels have been poured on the ground after water is applied at the large fire pit.

The frequency of fires at FPTA No. 4 during the 1950's and 1960's was estimated to be from one to as high as seven per week. In about 1973-1974 the number of fires was reduced to about twelve per year.

Fuels used at FPTA No. 4 have included contaminated JP-4, diesel fuel, AVGAS, thinners, paints, alcohols, waste oils and hydraulic and transmission fluids. In the mid 1970's the fuels used for fires began to be cleaner since many of the waste fluids were hauled off base to Fort Bragg. Approximately 400 to 600 gallons of fuel was typically used until 1973-1974. On occasions in the 1950's and 1960's extremely large fires using 2,000 gallons or more were noted. During the "energy crisis" in 1973-1974 the fuel usage dropped to 50 to 100 gallons per fire. However, it soon rose to the present 300 to 500 gallon level.


POPE AFB
FIRE PROTECTION TRAINING AREA NO. 4
Aldish Rd.
Hurst Dr.
VICINITY OF BURNING AREA IN 1950'S AND EARLY 1960'S
PRESENT INCINERATOR
PRESENT MOCKUP BURNING AREAS
225
210
200
OBSERVED LEACHATE AREAS (APPROXIMATE)
APPROXIMATE AREA FOR POL TANK CLEANING SLUDGE BURIAL (1950'S)
COMBUSTION BOX FOR POL ABSORBENT PADS
Tributary to Tank Creek
INSTALLATION BOUNDARY
N
0
200
400
SCALE
FEET
SOURCE: INSTALLATION DOCUMENTS

Wastes burned at FPTA No. 4 (and the earlier ones as well) were typically stored in drums at the site until the present fuel tank was installed. Up to 200 drums were stored at FPTA No. 4 at various times; some leaking drums existed. For the very large fires a fuel truck was often used to apply the combustibles to the ground.

At one time in the period 1965 to 1968 a pit about 50 feet x 50 feet x 3 feet deep was reportedly excavated at the site and used to dump drums filled or partially filled with combustibles. The materials in this pit were burned on two or three occasions before being covered with soil.

Absorbent pads used for cleaning up fuel and oil spills on the base are burned in an open container at FPTA No. 4. The site also reportedly has a burial pit which received sludge from cleaning some POL tanks in the 1960's. The location of this pit is believed to be near the small burning area. FPTA No. 4 also has been used to store paints. A small deteriorated structure existing at the site contains about 30 five-gallon cans of paint and other miscellaneous small containers of painting supplies.

The site at FPTA No. 4 slopes to the west toward the upper reaches of Tank Creek. During the site visit for this study, leaching of petroleum-type fluids were evident in two small drainage channels leading away from the fire training site. One small pit contained oil-bearing water. In addition to the oily leachate, a noticable fuel-petroleum odor existed on the downslope away from the burning areas. No significant vegetation damage was noted on the wooded site.

The extinquishing agents used at the Pope AFB fire training areas has been quite variable. In the 1950's and 1960's, carbon tetrachloride, carbon dioxide, chlorobromomethane, protein foam and dry chemicals were predominantly used. Halon and aqueous film forming foam (AFFF) started being used in the early 1970's. Currently dry chemicals, halon and AFFF are employed.

BASE WASTE DISPOSAL METHODS

Pope AFB has used the following facilities for management and disposal of waste:

- o Landfills
- o Hardfills
- o Sanitary Sewerage System
- o Surface Drainage System
- o Incinerators

Land 's

Based upon installation records and discussions with interviewees, no landfills have ever been operated on Pope AFB. Refuse, garbage, and other household-commercial type solid waste, as well as some shop wastes, have been taken off base to various landfills located on Fort Bragg. Wastes disposed off Pope AFB are not included as a part of the scope of this study.

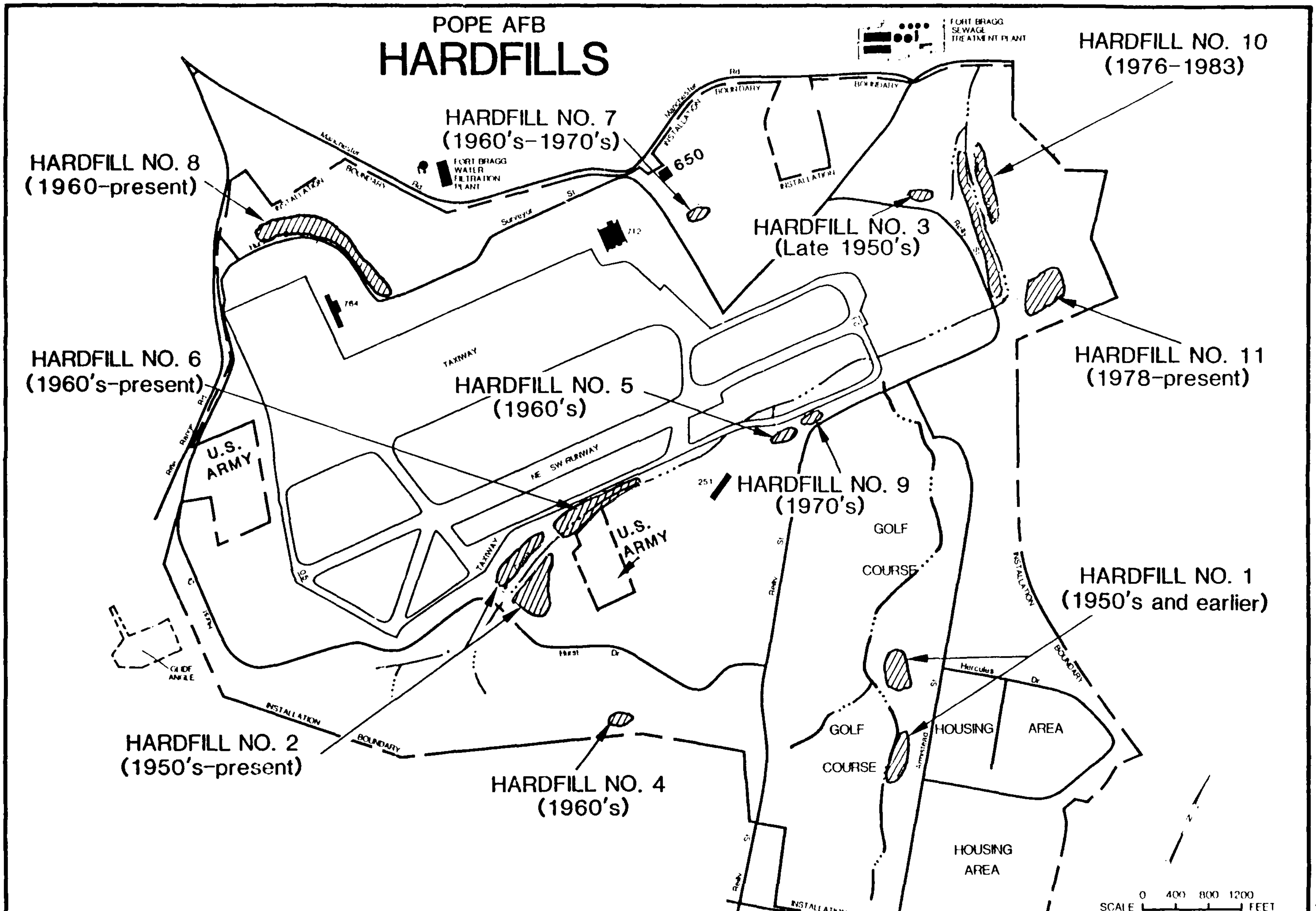
Hardfills

Numerous hardfill areas have been used for disposal of concrete, rock, soil, asphalt, brush scrap metal, scrap wood, appliances, and other construction/demolition wastes on Pope AFB. Eleven areas have been identified as shown in Figure 4.6. Appendix F contains photographs of some of the hardfills. A few of the sites may have intermittently received some small quantities of shop wastes, particularly during inspection periods when there was a need to cleanup a shop rapidly. However, such disposal of shop wastes could not be verified.

Hardfill No. 1

During construction of the golf course (1970 and 1978) two old hardfill areas were discovered (Figure 4.6). Materials uncovered included concrete, wood, ashes, glass jars, washers, nuts, pipe, nails and horse or mule shoes. It is believed these areas were used to bury demolition debris from the old structures that occupied the south part of the base. Some of the remnants also appear to have been from Army activities conducted in the area before Pope AFB was established. No drums or other evidence of hazardous materials were observed during the

FIGURE 4.6



SOURCE: INSTALLATION DOCUMENTS

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golf course construction. The existing area provides no indication of past disposal sites.

Hardfill No. 2

The area designated as Hardfill No. 2 in Figure 4.6 started in the 1950's, when realignment construction of the runways was in progress, and still operates today. The site is a low area adjacent to the headwaters of Tank Creek. Filling progressed from both sides of the creek. The southeast side is a relatively open gentle sloping area but the northwest side is steeper and wooded. Materials placed in the fill area have been mainly construction and demolition debris (concrete, wood, rocks, soil, asphalt, etc.). However, some interviewees indicated drums of unknown shop materials were buried on a few occasions. Site reconnaissance revealed about ten 55-gallon drums on the northwest site at ground level. The drums were partially open at the top and the contents was a granular sand-like material. A few empty 5-gallon containers of PD-680 and photographic or printing solutions were also observed. The southeast area of the site has been regularly used for storing materials such as gravel, soil, and asphalt chips required for pavement and grounds activities. Some motor oil and heating fuels were stored at the site also and some of the contents either leaked or was dumped to the ground.

Hardfill No. 3

The area designated as Hardfill No. 3 is in the base park area near the northeast gate. One interviewee reported burial of scrap metal in the late 1950's. No other wastes went into this area. There is no existing evidence of the burial area.

Hardfill No. 4

A small area south of Building 143 and east of Aldish Road was identified by interviewees as having served as a hardfill in the 1960's. Scrap metal, wood, and brush were deposited at this location. Some of the scrap metal was apparently removed in later years during some site grading activities. No shop wastes went into the site. Some evidence of brush and metal is currently evident at the surface.

Hardfill No. 5

This small hardfill area is located north of Galaxy Street where it intersects Reilly Street. The area filled was a low area between the street and Taxiway No. 10. Pavement debris and soil, were used for fill material and no shop or other wastes went into the site (Figure 4.6). The area was filled in the 1960's. There is no surficial evidence of disposed material at this site.

Hardfill No. 6

This site which has been used as a hardfill is on both sides of Tank Creek just downstream (east) of Hardfill No. 2. Material placed along the banks of the creek included concrete pavement, rocks, soil, tree stumps and other grounds debris. No shop wastes went to this area. Dumping of materials apparently started in the 1960's and has continued to recent years. Much of the debris from the golf course construction in the 1970's reportedly went to this area. Much of the concrete debris is currently visible on both banks of the creek.

Hardfill No. 7

The small area designated as Hardfill No. 3 (Figure 4.6) is located east of Building 715 adjacent to Booster Street. The site developed in the late 1960's or early 1970's. Fill material consisted of pavement debris and soil. No shop wastes were identified as having been placed at this site. The area is currently used to store heavy equipment parts.

Hardfill No. 8

The largest hardfill at Pope AFB is shown as Hardfill No. 8 in Figure 4.6. This site has received hardfill on a relatively continuous basis since 1960 compared with other sites which have been one-time-only or intermittent disposal areas. Hardfill No. 8 contains concrete, wood, scrap metal, appliances, building equipment, wiring, fixtures, ductwork, soil, brush and a variety of other construction and demolition debris resulting from base activities. Some containers with residual tar used for street patching have been put in the fill area. Some empty oil drums have been periodically buried at this site. A few interviewees believed some oil or other shop wastes may have been taken to this site prior to shop inspections but there are no confirmed reports to verify this. One interviewee indicated that in the late 1960's and early 1970's occasional dumping of JP-4 from the fuels management operations took place. Visual observation of the site shows evidence of filling with only hardfill materials.

Hardfill No. 9

This disposal area (Hardfill No. 9) for concrete and soil debris is located north of Reilly Street at the intersection with Academy Street and Maynard Street (just east of Hardfill No. 5). A low area between the street and taxiway was filled in the 1970's. No shop wastes went into this area. There is no evidence of disposed materials at the site now.

Hardfill No. 10

In the late 1970's the banks of Tank Creek at the east end of the runway were covered with broken concrete and other rock rubble. These hardfill materials were obtained from demolition operations on the base. No shop wastes were disposed at this Hardfill No. 10 site. The concrete debris was not covered and is visible along the creek.

Hardfill No. 11

Hardfill No. 11, located east of Reilly Street and the runway, has been used since the land was purchased in 1978-1979. Concrete, soil, wood, brush and other demolition material has been placed in the area. Some painted empty drums used for traffic control are stored at the site. No shop wastes have been deposited. Much of the debris is uncovered so it is visible at the ground surface.

Sanitary Sewerage System

Wastewaters from Pope AFB have always been discharged off-base to treatment facilities operated and maintained by Fort Bragg. The treatment facility is located close to the northern boundary of Pope AFB as previously shown in Figure 2.3. Table 4.1 shows there have several types of shop wastes discharged to the sewer system. Fort Bragg interviewees indicated that waste discharges from Pope AFB have disrupted the sewage treatment plant performance on several occasions. Wastes from aircraft washracks were particularly noted.

The sanitary sewer system has been used to dispose of waste from washing and rinsing, vehicle maintenance, and photographic operations. Photographic waste from the photo lab and the base clinic have been routinely placed into the sanitary sewer system. Fixer is passed through a silver recovery system prior to being placed into the sanitary sewer. Large quantities of dilute cleaning solutions are placed into the sanitary sewer system from washrack operations. Vehicle maintenance operations have placed large quantities of antifreeze (ethylene glycol) and PD-680 into the system. A number of oil/water separators were installed as part of the sanitary sewer system. The oil/water separators were installed at Pope AFB in the mid-1970's. A listing of the oil/-water separators, their locations and capacities are included in Appendix D (Table D.2). Waste which is collected in the separators is pumped out by Fort Bragg personnel and burned at the Fort Bragg heating plant. Prior to the installation of the oil/water separators, wastes placed into the sanitary sewer system went to the Fort Bragg wastewater treatment plant.

Surface Drainage System

Surface drainage facilities at Pope AFB consist of underground sanitary sewers, diversion structures and drainage ditches. Runoff from base administration, housing and recreational areas is directed via ditches, storm drains and tributaries to Tank Creek. Runoff from the airfield and industrial areas flows via storm drains and ditches to unnamed tributaries of Little River. The northeast section of the airfield and Taxiway No. 10 drains towards Tank Creek.

Tributaries of Little River have received small quantities of fuels and liquid waste in the runoff from the flightline and industrial shops. Tank Creek has received small quantities of fuels from the northeast section of the airfield. Larger spills have been contained through use of booms and drainage gates before reaching Little River. Based upon available information, it does not appear that Little River has received significant environmental contamination from operations at Pope AFB.

Incinerators

Pope AFB has operated an incinerator located near FPTA No. 4 for the past ten years. The current incinerator was placed into service approximately one year ago and replaced a similar unit which was used for about nine years. The incinerator has been used to burn classified material. The ash from the incinerator is placed in a dumpster and disposed by a private contractor. In the past, when Fort Bragg handled solid waste, disposal the ash was reported to be placed in a Fort Bragg landfill.

EVALUATION OF PAST DISPOSAL ACTIVITIES AND FACILITIES

Review of past waste generation and management practices at Pope AFB has resulted in identification of six sites and/or activities which were considered as areas of concern for potential contamination and migration of contaminants.

Sites Eliminated from Further Evaluation

The sites of initial concern were evaluated using the Flow Chart presented in Figure 1.2. Sites not considered to have a potential for contamination were deleted from further evaluation. The sites which have potential for contamination and migration of contaminants were evaluated using the Hazard Assessment Rating Methodology (HARM). Table 4.2 summarizes the results of the flow chart logic for each of the areas of initial concern.

Sixteen of the 22 sites assessed did not warrant further evaluation. The rationale for omitting these sites from HARM evaluation is discussed below.

Hardfill Nos. 1, 3, 4, 5, 6, 7, 9, 10 and 11 have received concrete, rock, soil, wood, brush, scrap metal and other construction and demolition debris. No reports were received of shop wastes going to these sites and visual observation reveals no contamination. Based upon this information, these nine hardfill areas are considered to have no potential hazard to health, welfare or the environment.

FPTA No. 1 was used for only a couple of years in the 1940's. There is no evidence of this previous site and the area is highly eroded. FPTA No. 2 operated for a few years off an old runway. The entire area has been reconstructed with a concrete apron and so any remnants of the facility are significantly disturbed. FPTA No. 3 was used only about a year and there is no visual evidence of the location of this site. These three fire protection training areas were all used a very short period of time and no visual evidence of their locations or potential contamination from them exists. One site is disturbed from construction activities. Based upon these conditions, FPTA Nos. 1, 2 and 3 are concluded to have no potential for contamination.

The sanitary sewerage system has received hazardous materials from the shops in the past. Similarly, the surface drainage system has

TABLE 4.2
SUMMARY OF FLOW CHART LOGIC FOR AREAS OF
INITIAL HEALTH, WELFARE AND ENVIRONMENTAL CONCERN
AT POPE AFB

Site	Potential Hazard to Health, Welfare or Environment	Need for Further IRP Evaluation/ Action	HARM Rating
Fire Protection Training Area No. 4	Yes	Yes	Yes
Tire Shop Waste Accumulaton Area	Yes	Yes	Yes
POL Bulk Storage Area	Yes	Yes	Yes
POL Tank Cleaning Sludge Disposal Area	Yes	Yes	Yes
Hardfill No. 2	Yes	Yes	Yes
Hardfill No. 8	Yes	Yes	Yes
Hardfill No. 1	No	No	No
Hardfill No. 3	No	No	No
Hardfill No. 4	No	No	No
Hardfill No. 5	No	No	No
Hardfill No. 6	No	No	No
Hardfill No. 7	No	No	No
Hardfill No. 9	No	No	No
Hardfill No. 10	No	No	No
Hardfill No. 11	No	No	No
Fire Protection Training Area No. 1	No	No	No
Fire Protection Training Area No. 2	No	No	No
Fire Protection Training Area No. 3	No	No	No
Sanitary Sewerage System	No	No	No
Surface Drainage System	No	No	No
Pesticide Handling	No	No	No
Other Waste Accumulation Areas	No	No	No

Source: Engineering-Science

received some wastes in previous years. An off-base wastewater treatment plant has provided for the base wastewater throughout its history. The surface drainage systems most susceptible to shop wastes were carried in closed conduits and short distances in open channels to discharge points off-base. Due to the small and infrequent discharges to the surface drainage system, minimal potential contamination results.

Review of the pesticide handling procedures does not indicate any potential for environmental contamination. No major pesticide spills have been noted.

Areas used for accumulating wastes, except at the tire shop, do not have any reported spills or leaks that would cause environmental contamination.

Sites Evaluated Using HARM

The remaining six sites identified in Table 4.2 were evaluated using the Hazard Assessment Rating Methodology. The HARM process takes into account characteristics of potential receptors, waste characteristics, pathways for migration, and specific characteristics of the site related to waste management practices. Results of the HARM analysis for the sites are summarized in Table 4.3.

The procedures used in the HARM system are outlined in Appendix G and the specific rating forms for the five sites at Pope AFB are presented in Appendix H. The HARM system is designed to indicate the relative need for follow-on action.

TABLE 4.3
SUMMARY OF HARM SCORES FOR
POTENTIAL CONTAMINATION SITES
AT POPE AFB

Rank	Site	Receptor Subscore	Waste Charac- teristics Subscore	Pathways Subscore	Waste Management Factor	HARM Score
1	Fire Protection Training Area No. 4	62	80	80	1.0	74
2	POL Bulk Storage Area	64	80	80	0.95	71
3	Tire Shop Waste Accumulation Area	70	60	80	1.0	70
4	POL Sludge Disposal Area	64	36	80	1.0	60
5	Hardfill No. 2	59	48	68	1.0	58
6	Hardfill No. 8	61	40	61	1.0	54

NOTE: HARM Score = [(Receptors + Waste Characteristics + Pathways) x 1/3] x Waste Management Factor

Source: Engineering-Science

SECTION 5

CONCLUSIONS

The goal of the IRP Phase I study is to identify sites where there is potential for environmental contamination resulting from past waste disposal practices and to assess the probability of contamination migration from these sites. The conclusions given below are based on field inspections; review of records and files; review of the environmental setting; interviews with base personnel, past employees and local, state and federal government employees; and assessments using the HARM system. Table 5.1 contains a list of the potential contamination sources identified at Pope AFB and a summary of the HARM scores for those sites.

FIRE PROTECTION TRAINING AREA NO. 4

This fire protection training area, which has served Pope AFB since 1955, has sufficient potential to create environmental contamination and follow on studies are justified. Prior to the mid-1970's, fuels which have been burned in the area have included: contaminated JP-4, diesel fuel, AVGAS, thinners, paints, alcohols, waste oils and hydraulic fluids. Since the mid-1970's, the fuels which have been burned include contaminated JP-4 and waste oils. Except for the period of 1973-1974 large quantities of fuel were burned at this site. In 1973-1974 during the "energy crisis" fuel burning dropped significantly, but since that time the quantities of fuel burned have risen. Water has been applied to the area before waste fuels have been poured on the ground. The smaller fire pit has concrete side walls and concrete bottom. The larger pit does not have any type of concrete containment or an underdrain collection system. In addition, some POL tank sludge is reportedly buried on the site, and some waste liquids in drums were buried and burned. Due to the waste characteristics and pathways, the area received a HARM score of 74.

TABLE 5.1
SITES EVALUATED USING THE
HAZARD ASSESSMENT RATING METHODOLOGY
POPE AFB

Rank	Site	Operation Period	HARM Score(1)
1	Fire Protection Training Area No. 4	1955 - Present	74
2	POL Bulk Storage Area	1950's-Present	71
3	Tire Shop Waste Accumulation Area	1975 - Present	70
4	POL Sludge Disposal Area	1950's-1975	60
5	Hardfill No. 2	1950's-Present	58
6	Hardfill No. 8	1960 - Present	54

(1) This ranking was performed according to the Hazard Assessment Rating Methodology (HARM) described in Appendix G. Individual rating forms are in Appendix H.

POL BULK STORAGE AREA

This site has sufficient potential to create environmental contamination and follow-on investigation is warranted. In addition, water quality monitoring and general site observation by base personnel indicate suspected contamination in the area. The POL bulk storage area has been subjected to several spills since the mid-1950's. While much of the fuel spilled was recovered, the number of spills that have occurred in the area and the potential pollutant pathways result in a HARM score of 71.

TIRE SHOP WASTE ACCUMULATION AREA

The Tire Shop waste accumulation area has sufficient potential to create environmental contamination and follow-on investigation is warranted. This area has been subject to several spills and leaks of paint stripper. Spills of stripper from within the Tire Shop have migrated to the ground outside the shop. In addition, a drum leak within the past year has resulted in soil contamination. The receptor and pathways subscores contributed to the HARM score of 70.

POL SLUDGE DISPOSAL AREA

This area, used for a number of years to dispose sludge resulting from POL tank cleanouts, has sufficient potential to create environmental contamination and additional follow-on investigation activities are justified. This area was used to dispose the sludge from the mid 1950's until 1975. The receptor and pathways subscores contributed to a HARM score of 60.

HARDFILL NO. 2

This hardfill area has sufficient potential to create environmental contamination and follow-on investigation is warranted. Materials placed in the landfill have consisted mainly of construction and demolition debris; but some interviewees indicated motor oil and heating fuels leaked or were dumped on the ground and that a few drums of unknown shop wastes were buried. The area received a HARM score of 58 mainly due to the receptor and pathways subscores.

HARDFILL NO. 8

This hardfill has sufficient potential to create environmental contamination and follow-on investigation is warranted. Although the major volume of material disposed at this site is hardfill, some occasional dumping of JP-4 occurred in the late 1960's and early 1970's. The receptor and pathways subscores mainly contributed to the total HARM score of 54.

SECTION 6
RECOMMENDATIONS

Six sites were identified at Pope AFB as having the potential for environmental contamination. These sites have been evaluated and rated using the HARM system which assesses their relative potential for contamination and provides the basis for determining the need for additional Phase II IRP investigations. All of the sites have sufficient potential to create environmental contamination and warrant Phase II investigations. The sites evaluated have been reviewed concerning land use restrictions which may be applicable.

RECOMMENDED PHASE II MONITORING

The subsequent recommendations are made to further assess the potential for environmental contamination from waste disposal areas at Pope AFB. The recommended actions are sampling and monitoring programs to determine if contamination does exist at the site. If contamination is identified in this first-step investigation, the Phase II sampling program will probably need to be expanded to define the extent and type of contamination. Geophysical surveys, consisting of electrical resistivity, are recommended prior to the well installations at two sites. This is performed to attempt to delineate the horizontal and vertical extent of the site as well as any subsurface leachate plumes migrating from the site. Preliminary checks should be made to determine the effectiveness of geophysics prior to a complete site survey. Following the geophysical surveys, ground water monitoring wells will be installed and sampled. In addition, soil borings, surface water and analysis are recommended for various sites. The recommended monitoring programs are summarized in Table 6.1 and discussed below for each site.

Fire Protection Training Area No. 4

The Fire Protection Training Area No. 4 has a potential for environmental contamination and monitoring at this site is recommended. An electrical resistivity survey should be conducted as the first Phase II step. The survey should take place between the 200 foot elevation level and Aldish Road. Results from the survey should be used to guide the placement of monitoring wells and soil borings. Figure 6.1 shows a preliminary location for wells and borings. The well locations assume ground water flow is east to west; these locations would be adjusted, if necessary, after obtaining geophysical data. Surface drainage leachate and ground water should be sampled and analyzed for the parameters listed in Table 6.2, List A.

The soil borings should be placed beside the large burning area as shown in Figure 6.1. A third control boring, taken upgradient of the FPTA, can be at the same location as the upgradient well. The soil borings should be taken to a depth of 10 feet or to the water table if it is less than 10 feet. Soil samples should be taken every two feet and analyzed for the parameters listed in Table 6.2, List B. The one upgradient and four downgradient wells should be installed within the uppermost aquifer. The wells should be constructed using Schedule 40 PVC and be screened 5-10 feet into the aquifer. Ground water samples would be analyzed for the parameters listed in Table 6.2 List A.

POL Bulk Storage Area

The POL Bulk Storage Area has potential for environmental contamination and monitoring at this site is recommended. Surface water should be sampled at four points downstream and one point upstream from the area. One of the downstream sampling points should be located where past sampling has taken place. The upstream sample will act as the control. Soil borings should be taken in seepage areas and within the diked POL tank areas (shown in Figure 6.2) to a depth of 10 feet or to the water table of it is less than 10 feet. Samples should be analyzed every two feet for the parameters in Table 6.2, List B. A geophysical survey is recommended to identify potential contamination plumes and to guide the placement of one upgradient and six downgradient wells within

TABLE 6.1
RECOMMENDED MONITORING PROGRAM FOR PHASE II IRP
AT POPE AFB

Site (Rating Score)	Recommended Monitoring Program
Fire Protection Training Area No. 4 (74)	Perform a geophysical survey to define potential contamination plumes. Take three soil borings (including one control), 10 feet deep or to the water table if it is less than 10 feet deep. Collect soil samples every 2 feet and analyze for the parameters in List B, Table 6.2. Sample surface discharge leachate at appropriate locations. Install and sample one upgradient and four downgradient wells. Construct wells with Schedule 40 PVC and screen 5-10 feet into the uppermost aquifer. Analyze the samples for the parameters in List A, Table 6.2. Tentative sampling and well locations are shown in Figure 6.1.
POL Bulk Storage Area (71)	Sample surface water upstream (control) and four points downstream. One of the downstream sampling points should be at the location where past sampling has taken place. Sampling and tentative well locations are shown in Figure 6.2. Take soil borings in seepage areas and the diked areas 10 feet deep or to the water table if it is less than 10 feet. Obtain soil samples every 2 feet and analyze for the parameters in List B, Table 6.2. Perform a geophysical survey to define potential contamination plumes. Install seven monitoring wells with one located upgradient of the site to act as a control. Construct wells with Schedule 40 PVC and screen 5-10 feet into the uppermost aquifer. Analyze the samples for the parameters in List A, Table 6.2.
Tire Shop Waste Accumulation Area (70)	Take three soil borings (one control) 10 feet deep or to the water table if it is less than 10 feet. Analyze the soil every 2 feet for the parameters in List C, Table 6.2.

TABLE 6.1
RECOMMENDED MONITORING PROGRAM FOR PHASE II IRP
AT POPE AFB
(Continued)

Site (Rating Score)	Recommended Monitoring Program
POL Sludge Disposal Area (60)	Take two soil borings (one control) 10 feet deep or to the water table if it is less than 10 feet. Analyze the soil every 2 feet for the parameters in List B, Table 6.2.
Hardfill No. 2 (58)	Take two or three water and sediment samples in the stream during dry weather. Take one control sample upstream of the tributary from the FPTA No. 4. Analyze the water samples for the parameters in List D, Table 6.2 and the soil samples for those in List B.
Hardfill No. 8 (54)	Perform a geophysical survey to define potential contamination plumes. Install one upgradient well and four downgradient wells. Construct wells with Schedule 40 PVC and screen 5-10 feet into the uppermost aquifer. Analyze the ground water samples for the parameters in List A, Table 6.2.

Source: Engineering-Science

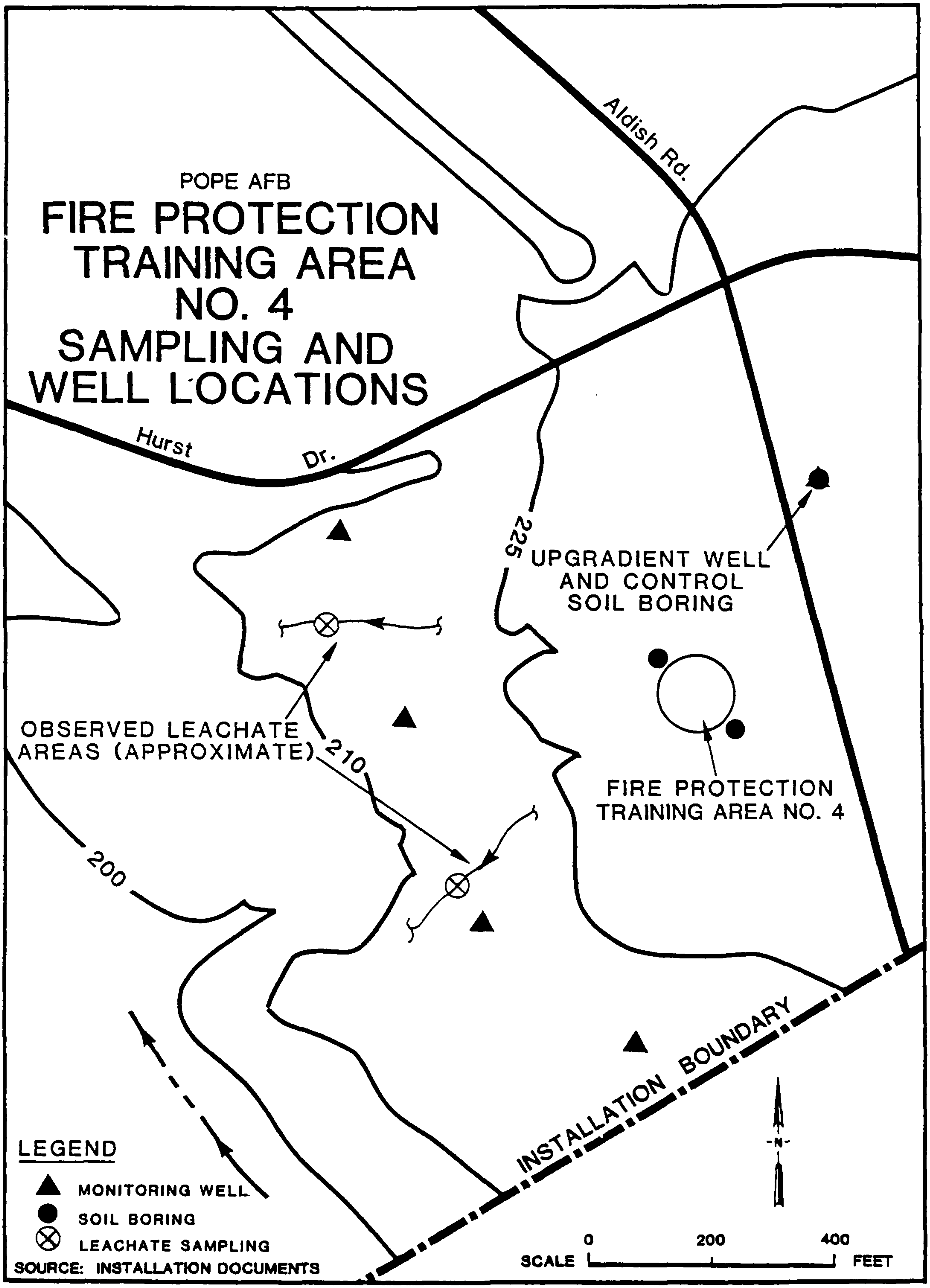

POPE AFB
FIRE PROTECTION TRAINING AREA NO. 4 SAMPLING AND WELL LOCATIONS
Aldish Rd.
Hurst Dr.
225
210
200
UPGRADIENT WELL AND CONTROL SOIL BORING
OBSERVED LEACHATE AREAS (APPROXIMATE)
FIRE PROTECTION TRAINING AREA NO. 4
INSTALLATION BOUNDARY
LEGEND
MONITORING WELL
SOIL BORING
LEACHATE SAMPLING
SOURCE: INSTALLATION DOCUMENTS
0
200
400
SCALE
FEET
N

TABLE 6.2
RECOMMENDED LIST OF ANALYTICAL PARAMETERS
POPE AFB

LIST A

Oil and Grease

Volatile Organics

Total Organic Halogens

Total Organic Carbon

pH

Lead

LIST B

Oil and Grease

EP Toxicity (Metals Only)

Volatile Organics

LIST C

Volatile Organics

Phenol

pH

EP Toxicity (Metals Only)

LIST D

Oil and Grease

Total Organic Halogens

Total Organic Carbon

Specific Conductance

pH

---

the uppermost aquifer. The tentative locations of the monitoring wells are shown in Figure 6.2. These locations assume ground water flow is from south to north and they will need to be adjusted if geophysical data indicates a potentially different direction. The wells should be constructed with Schedule 40 PVC and be screened 5-10 feet into the uppermost aquifer. Groundwater samples will be analyzed for the parameters shown in Table 6.2, List A.

Tire Shop Waste Accumulation Area

The Tire Shop waste accumulation area is contaminated and further evaluation is required. Two soil borings should be taken in the area and one control boring obtained away from the site. The soil borings should be taken to a depth of 10 feet or to the water table if it is less than 10 feet. The soil samples should be collected and analyzed every two feet for the parameters listed in Table 6.2, List C. If soil contamination is confirmed, monitoring wells and more soil sampling may be necessary to assess the extent of ground water contamination.

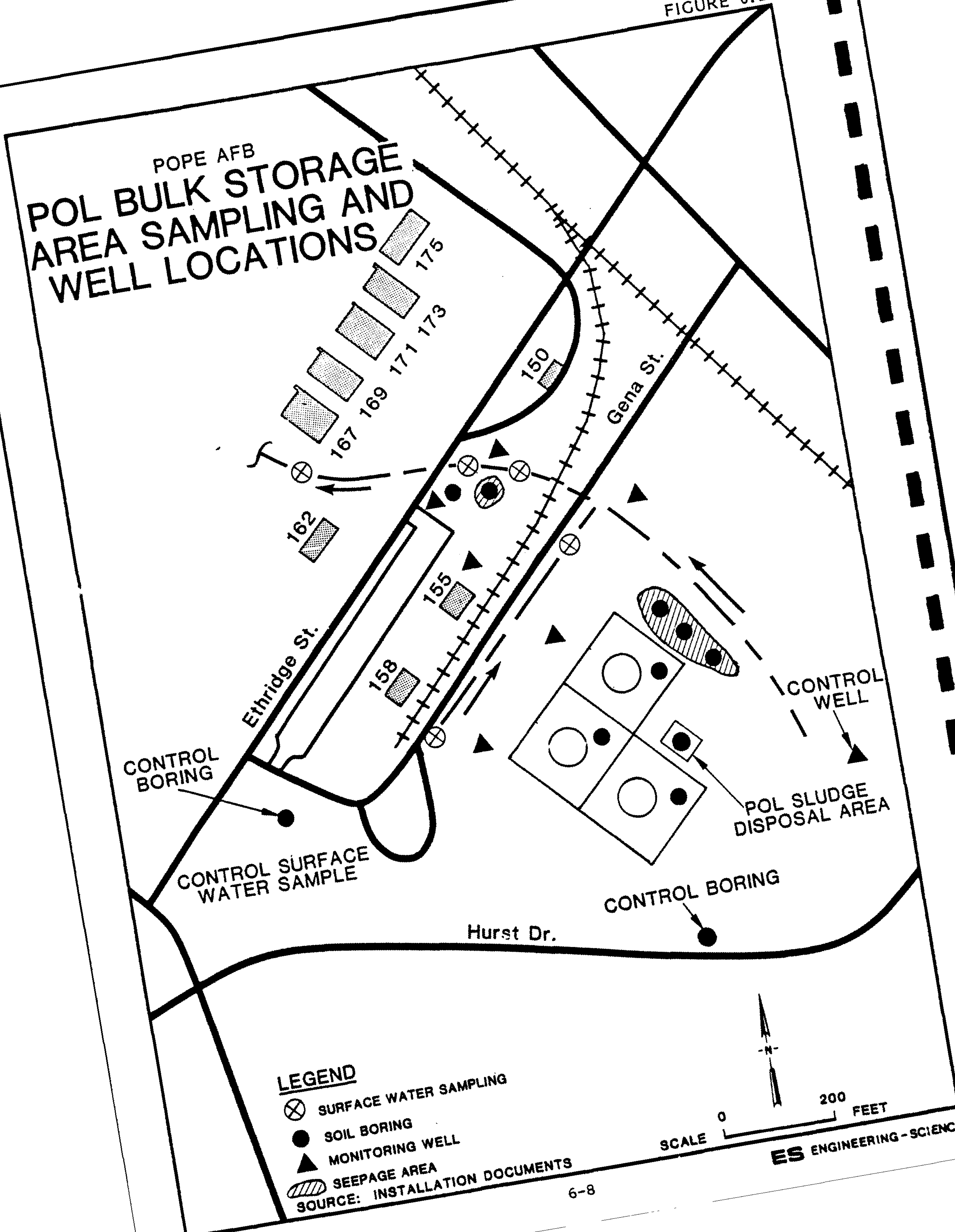
POL Sludge Disposal Area

The POL sludge disposal area is recommended to be investigated further for potential contamination. One soil boring should be taken in the sludge pit and a control boring should also be taken away from the disposal area (Figure 6.2). The soil borings should be analyzed every two feet for the parameters listed in Table 6.2 List B. Monitoring wells will be installed in the POL Bulk Storage Area to determine the extent of ground water contamination. If soil contamination is confirmed at the sludge disposal area, some additional monitoring wells (beyond those for the POL storage area) and more soil sampling may be necessary to assess the extent of ground water contamination.

Hardfill No. 2

The Hardfill No. 2 has potential for environmental contamination and monitoring of this site is recommended. The stream which runs through the hardfill should be sampled and analyzed for the parameters in Table 6.2, List D. Two to three water and sediment samples should be taken during dry weather along the stream. A control water and sediment sample should be taken upstream of the confluence with the FPTA No. 4

FIGURE 6.2



POPE AFB
POL BULK STORAGE AREA SAMPLING AND WELL LOCATIONS
175
173
171
169
167
162
150
155
158
Gena St.
Ethridge St.
CONTROL BORING
CONTROL SURFACE WATER SAMPLE
CONTROL WELL
POL SLUDGE DISPOSAL AREA
CONTROL BORING
Hurst Dr.
N
LEGEND
SURFACE WATER SAMPLING
SOIL BORING
MONITORING WELL
SEEPAGE AREA
SOURCE: INSTALLATION DOCUMENTS
SCALE 0 200 FEET
ES ENGINEERING-SCIENCE

tributary. The sediment samples should be analyzed for the parameters included in Table 6.2, List B. If water and/or sediment contamination is confirmed, monitoring wells and more water and sediment samples may be necessary to assess the type and extent of contamination.

Hardfill No. 8

Hardfill No. 8 is recommended to be investigated further for potential contamination. One upgradient and four downgradient monitoring wells in the uppermost aquifer should be installed. Ground water samples collected from the wells should be analyzed for the parameters in Table 6.2, List A.

RECOMMENDED GUIDELINES FOR LAND USE RESTRICTIONS

It is desirable to have land use restrictions for the identified sites to (1) provide continued protection of human health, welfare, and environment, (2) insure that migration of potential contaminants is not promoted through improper land uses, (3) facilitate compatible development of future USAF facilities and (4) allow identification of property which may be proposed for excess or outlease.

The recommended guidelines for land use restrictions at each identified disposal site at Pope AFB are presented in Table 6.3. A description of the land use restriction guidelines is included in Table 6.4. Land use restrictions at sites recommended for on-site monitoring should be re-evaluated upon completion of the Phase II program and appropriate changes made.

TABLE 6.3
RECOMMENDED GUIDELINES FOR FUTURE LAND USE RESTRICTIONS
POPE AFB

Site Name	Construction	Excavation	Wells	Agriculture	Silviculture	Water Infiltration	Recreation	Burning	Disposal Operations	Vehicular Traffic	Material Storage	Housing
Hardfills No. 2 and No. 8	NR	R	R	R	R	R	NR	NR	R(2)	NR	NR(3)	R
Fire Protection Training Area No. 4	NR	NR	R	R	R	R	R	NR	R(2)	NR	NR(3)	R
Tire Shop Waste Accumulation Area	NR	NR	R	R	R	R	NR	R	R(2)	NR	NR	R
POL Bulk Storage Area	NR	NR	R	R	R	R	NR	R	R(2)	NR	NR	R
POL Tank Cleaning Sludge Disposal Area	NR	NR	R	R	R	R	NR	R	R(2)	NR	NR(3)	R
Hardfill Nos. 1, 3, 4, 5, 6, 7, 9, 10 and 11	NR	R	R	NR	NR	NR	NR	NR	NR	NR	NR	NR
Fire Protection Training Area Nos. 1 and 3	NR	NR	R	NR	R	R	NR	NR	R(2)	NR	NR(3)	R
Fire Protection Training Area No. 2	NR	NR	R	NA	NA	R	NR	NR	NA	NR	NA	R
Other Waste Accumulation Areas	NR	NR	R	NR	R	R	NR	NR	R(2)	NR	NR	R

Notes: NA = Not Applicable
NR = No Restriction
R = Restriction

(1) See Table 6.4 for description of guidelines
(2) Restrict for all wastes except for construction/demolition debris
(3) No restriction on solid materials but liquids undesirable

TABLE 6.4
DESCRIPTION OF GUIDELINES FOR LAND USE RESTRICTIONS

Guideline	Description
Construction on the site	Restrict the construction of structures which make permanent (or semi-permanent) and exclusive use of a portion of the site's surface.
Excavation	Restrict the disturbance of the cover or subsurface materials.
Well construction on or near the site	Restrict the placement of any wells (except for monitoring purposes) on or within a reasonably safe distance of the site. This distance will vary from site to site, based on prevailing soil conditions and ground-water flow.
Agricultural use	Restrict the use of the site for agricultural purposes to prevent food chain contamination.
Silvicultural use	Restrict the use of the site for silvicultural uses (root structures could disturb cover or subsurface materials).
Water infiltration	Restrict water run-on, ponding and/or irrigation of the site. Water infiltration could produce contaminated leachate.
Recreational use	Restrict the use of the site for recreational purposes.
Burning or ignition sources	Restrict any and all unnecessary sources of ignition, due to the possible presence of flammable compounds.
Disposal operations	Restrict the use of the site for waste disposal operations, whether above or below ground.
Vehicular traffic	Restrict the passage of unnecessary vehicular traffic on the site due to the presence of explosive material(s) and/or of an unstable surface.
Material storage	Restrict the storage of any and all liquid or solid materials on the site.
Housing on or near the site	Restrict the use of housing structures on or within a reasonably safe distance of the site.

TABLE OF CONTENTS
APPENDICES

TABLE OF CONTENTS
(Continued)

APPENDIX A

BIOGRAPHICAL DATA

Biographical Data

ROBERT L. THOEM
Civil/Environmental Engineer

Personal Information

[redacted]

Education

B.S. Civil Engineering, 1962, Iowa State University, Ames, IA
M.S. Sanitary Engineering, 1967, Rutgers University, New Brunswick, NJ

Professional Affiliations

Registered Professional Engineer in six states
American Academy of Environmental Engineering (Diplomate)
American Society of Civil Engineers (Fellow)
National Society of Professional Engineers (Member)
Water Pollution Control Federation (Member)

Honorary Affiliations

Who's Who in Engineering
Who's Who in the Midwest
USPHS Traineeship

Experience Record

1962-1965 U.S. Public Health Service, New York, NY. Staff Engineer, Construction Grants Section (1962-1964). Technical and administrative management of grants for municipal wastewater facilities.

Water Resources Section Chief (1964-1965). Supervised preparation of regional water supply and pollution control reports.

1966-1983 Stanley Consultants, Muscatine, IA and Atlanta, GA. Project Manager and Project Engineer (1966-1973). Responsible for managing studies and preparing reports for a variety of industrial and governmental environmental projects.

Environmental Engineering Department Head (1973-1976). Supervised staff involved in auditing environmental practices, conducting studies and preparing reports concerning water and wastewater systems, solid waste and resource recovery and water resources projects (industrial and governmental).

Resource Management Department Head (1976-1982). Responsible for multidiscipline staff engaged in planning and design of water and wastewater systems, solid waste and resource recovery, water resources, bridge, site development and recreational projects (industrial, domestic and foreign governments).

Associate Chief Environmental Engineer (1980-1983). Corporate-wide quality assurance responsibilities on environmental engineering planning projects.

Operations Group Head and Branch Office Manager (1982-1983). Directed multidiscipline staff responsible for planning and design of steam generation, utilities, bridge, water and wastewater systems, solid waste and resource recovery, water resources, site development and recreational projects (industrial, domestic and foreign governments). Administered branch office support activities.

Project Manager/Engineer for over 25 industrial projects, 25 city and county projects ranging in present study area population from 1,400 to 1,700,000, 10 regional (multi-county) planning or operating agency projects, five state agency projects, 10 projects for federal agencies, and several projects for Middle East governments.

1983-Date Engineering-Science. Senior Project Manager. Responsible for managing a variety of environmental projects. Conducted hazardous waste investigations at seven U.S. Air Force installations to identify the potential migration of contaminants resulting from past disposal practices under the Phase I Installation Restoration Program. Evaluated solid waste collection, disposal and potential for resource recovery at a U. S. Army post.

Publications and Presentations

Thirteen presentations and/or papers in technical publications dealing with solid waste, sludge, water, wastewater and project cost evaluations.

Biographical Data

JOHN R. ABSALON
Hydrogeologist

Personal Information

[redacted]

Education

B.S. in Geology, 1973, Upsala College, East Orange, New Jersey

Professional Affiliations

Certified Professional Geologist (Indiana No. 46) (Virginia No. 241)
Association of Engineering Geologists
Geological Society of America
National Water Well Association

Experience Record

1973-1974 Soil Testing Incorporated-Drilling Contractors, Seymour, Connecticut. Geologist. Responsible for the planning and supervision of subsurface investigations supporting geotechnical, ground-water contamination, and mineral exploitation studies in the New England area. Also managed the office staff, drillers, and the maintenance shop.

1974-1975 William F. Loftus and Associates, Englewood Cliffs, New Jersey. Engineering Geologist. Responsible for planning and management of geotechnical investigations in the northeastern U.S. and Illinois. Other duties included formal report preparation.

1975-1978 U.S. Army Environmental Hygiene Agency, Fort McPherson, Georgia. Geologist. Responsible for performance of solid waste disposal facility siting studies, non-complying waste disposal site assessments, and ground-water monitoring programs at military installations in the southeastern U.S., Texas, and Oklahoma. Also responsible for operation and management of the soil mechanics laboratory.

1978-1980 Law Engineering Testing Company, Atlanta, Georgia. Engineering Geologist/Hydrogeologist. Responsible for the project supervision of waste management, water quality assessment, geotechnical, and hydrogeologic studies at commercial, industrial, and government facilities. General experience included planning and management of several ground-water monitoring programs, John R. Absalon (Continued)

development of remedial action programs, and formulation of waste disposal facility liner system design recommendations. Performed detailed ground-water quality investigations at an Air Force installation in Georgia, a paper mill in southwestern Georgia, and industrial facilities in Tennessee.

1980-Date Engineering-Science. Hydrogeologist. Responsible for supervising efforts in waste management, solid waste disposal, ground-water contamination assessment, leachate generation, and geotechnical and hydrogeologic investigations for clients in the industrial and governmental sectors. Performed geologic investigations at twelve Air Force bases and otherindustrial sites to evaluate the potential for migration of hazardous materials from past waste disposal practices. Conducted RCRA ground-water monitoring studies for industrial clients and evaluated remedial action alternatives for a county landfill in Florida. Conducted quality management, hydrogeologic and ground-water quality programs for the pulp and paper industry at several mills located in the Southeast United States.

Publications and Presentations

Eleven presentations and/or papers in technical publications or conferences dealing with geology, ground water, and waste disposal/-ground water interaction.

Biographical Data

THOMAS R. HARPER
Environmental Scientist

Personal Information

[redacted]

Education

B.S. in Chemistry, 1983, Ohio State University, Columbus, OH
B.S. in Microbiology, 1983, Ohio State University, Columbus, OH

Professional Affiliations

American Chemical Society

Experience Record

1983-Date Engineering-Science, Inc., Atlanta, Georgia.

Analytical Chemist (1983-1984). Laboratory work involved analyzing samples from industrial clients. Analysis for priority pollutants, heavy metals, and organic compounds on samples including soils, sludges, water, and wastewater. Experience with instrumentation includes TOC, gas and liquid chromatography, atomic absorption, infra-red and nuclear magnetic resonance spectroscopy.

Bench scale wastewater treatability testing includes studies of PCB and DEHP removal for a capacitor manufacturer, organics removal for a pharmaceutical company, and solids removal for a food processing plant. Bioassay study was performed for a specialty chemical company. Geophysical surveys using electrical resistivity for a pesticide manufacturer and a lead reclamation facility.

Environmental Scientist (1984-Date). Involved in the development of environmental studies, inventories, and evaluations for municipal, industrial, and federal government projects.

Participated in environmental audits of past waste disposal practices including the disposal of hazardous wastes. These evaluations were conducted at two Air Force Bases. This involved records search, data evaluation, shop inspections, disposal site investigations and ecological analysis for these installations.

Thomas R. Harper (Continued)

A key member in the preparation of a Part B for an adhesives manufacturing facility operated by General Electric. Project Manager for a hazardous waste Closure Plan and Part A revision under RCRA for General Motors. Prepared a satellite accumulation plan required under RCRA for an adhesives manufacturer. The plan outlined the RCRA requirements for hazardous waste storage of less than 90 days.

APPENDIX B

LIST OF INTERVIEWEES AND OUTSIDE AGENCY CONTACTS

TABLE B.1
LIST OF INTERVIEWEES

	Most Recent Position	Years of Service
1.	Deputy of Operations	23
2.	Chief, Planning	36
3.	Assistant Fire Chief (Retired)	29
4.	Foreman, Entomology	5
5.	Chief, Engineering and Construction	15
6.	Community Planner	4
7.	Real Property Officer	21
8.	Chief, Systems Maintenance	30
9.	Foreman, Liquid Fuels Maintenance	24
10.	Assistant Fire Chief	24
11.	Superintendent, Pavement and Grounds	16
12.	Superintendent, CE Mechanical	31
13.	Small Engine Repair	27
14.	Assistant Chief, Supply (Retired)	31
15.	Environmental Officer, Fort Bragg	4
16.	Chief, Roads and Grounds, Fort Bragg	39
17.	Superintendent, Water and Wastewater, Fort Bragg	21
18.	Chief, Maintenance Division, Fort Bragg	15
19.	NCOIC, Equipment Shop	2
20.	Civilian, Aircraft Structural Repair Technician	19
21.	Fuels Superintendent	3
22.	NCOIC, Distribution	6
23.	NCOIC, Structural	5
24.	NCOIC, Metal Processing	2
25.	AIC Transportation Refueling Maintenance	2
26.	NCOIC, Transportation Vehicle Maintenance	1
27.	NCOIC, AGE Servicing	6
28.	Civilian, Superintendent Electric Shop	1
29.	Civilian, Manager BX Station	4
30.	NCOIC, Refrigeration Shop	2
31.	Resource Advisor-Bldg. Manager	4
32.	Civilian, Assistant AR Shop Chief	29
33.	Civilian, Base Audiovisual Manager and Contract Monitor	15
34.	NCOIC, Base Reprographics	2
35.	Civilian, Foreman of Paint Shop	14
36.	Support Branch Chief, Wash Rack	1
37.	NCOIC, Non Powered AGE	11
38.	NCOIC, Phase Dock	2
39.	NCOIC, Wheel and Tire	5

TABLE B.1
LIST OF INTERVIEWEES
(Continued)

	Most Recent Position	Years of Service
40.	NCOIC, Engine Test	1
41.	Civilian, Superintendent of Propulsion Branch	1
42.	Civilian, Environmental Planner	3
43.	NCOIC, Non Destructive Inspection	3
44.	NCOIC, Corrosion Control	3
45.	Base Bioenvironmental Engineer	2
46.	NCOIC, Pneudraulics	1
47.	NCOIC, Electric	3
48.	NCOIC, Doppler Shop	6
49.	Superintendent of Radio/TV	1
50.	NCOIC, Quality Control	2
51.	Superintendent of ATC	2
52.	Service Platoon Sergeant	13
53.	Aviation Safety Officer	5
54.	Aerospace Systems Branch Chief	1
55.	NCOIC, Fire Department Maintenance	1
56.	NCOIC, Base Service Station	1
57.	Training NCOIC, Fuels Lab	7

TABLE B.2
OUTSIDE AGENCY CONTACTS

Mr. M. J. Noland, Regional Supervisor
Tom Stevens, Regional Engineer
Water Quality Section
North Carolina Division of Environmental Management
Wachovia Building, Suite 714
Fayetteville, NC 28301
919/486-1541

Jane Basnight, Librarian
Environmental Management Library
North Carolina Division of Environmental Management
Archdale Building
512 North Salisbury Street
Raleigh, NC 27611
919/733-7015

Maurice D. Winner, Jr., Hydrologist
US Geological Survey - Water Resources Division
P. O. Box 2857
Raleigh, NC 27602
919/755-4510

Julian McIntire, District Conservationist
U.S. Department of Agriculture, Soil Conservation Service
2485 Gillespie Street, Room 130
Fayetteville, NC 28306
919/484-8479

D. Delsanto, Hydrogeologist
Residuals Management Branch
U.S. Environmental Protection Agency
345 Courtland Street, N.E.
Atlanta, GA 30365
404/881-2864

William Lewis
Modern Military Field Branch
Washington National Record Center
4025 Suitland Road
Suitland, MD
301/763-1710

TABLE B.2
OUTSIDE AGENCY CONTACTS
(Continued)

Mr. J. Dwyer
Cartographic and Architectural Branch
National Archives
841 S. Pickett Street
Alexandria, VA 22304
703/756-6700

Mr. E. Reese
Modern Military Branch
National Archives
8th and Pennsylvania Avenue
Washington, D.C.
202/523-3340

Sgt. Jernigan
Office of Air Force History
Bolling AFB
Washington, D.C.
202/767-5090

APPENDIX C

TENANT ORGANIZATIONS AND MISSIONS

APPENDIX C

TENANT ORGANIZATIONS AND MISSIONS

The following is a listing of major tenant organizations at Pope AFB, along with the missions for some of the units.

1st Aeromedical Evacuation Squadron

This unit provides tactical airlift forces with a specialized mission capability in tactical aeromedical evacuation. It maintains capability to provide two separate tactical aeromedical evacuation systems for supporting operational contingencies. The unit also monitors the training of other designated Air Force evacuation units and conducts field exercises to insure that proficiency is maintained.

215th Field Training Detachment

Provides training support to Pope AFB personnel with classroom and on-the-job instruction. Training includes all aspects of maintenance for aircraft based at Pope. The unit also provides special training for the Coast Guard.

1943rd Information Systems Squadron

This unit operates and maintains communications-electronics facilities and navigational aids to provide air traffic control services for Pope AFB.

Detachment 21, 15th Weather Squadron

Detachment 21 provides current and projected weather information to pilots for local and cross country flying operations.

Detachment 12, 1600th Management Engineering Squadron

This unit provides special study support for personnel manning requirements and related areas. It also reviews, coordinates and approves various personnel actions.

Air Force Office of Special Investigations, Detachment 2101

Detachment 2101 provides specialized investigative support to Pope AFB commanders with respect to criminal, counter-intelligence and fraud investigations.

Other Pope Tenant Organizations

- Area Defense Counsel, Detachment QD2Q
- 53rd Mobile Aerial Port Squadron

APPENDIX D

SUPPLEMENTAL BASE FINDINGS INFORMATION

TABLE D.1
PETROLEUM STORAGE FACILITIES
POPE AFB

Type of Material	Capacity Each Tank (gallons)	Type of Storage Facility	Location of Storage Facility
No. 2 Fuel Oil	1,000	U/G Steel Tank	24 Special Services
No. 2 Fuel Oil	2,000	U/G Steel Tank	25 Nursery
No. 2 Fuel Oil	175	U/G Steel Tank	26
No. 2 Fuel Oil	1,000	U/G Steel Tank	140 TCF
No. 2 Fuel Oil	2,000	A/G Steel Tank	141
No. 2 Fuel Oil	3,000	U/G Steel Tank	150 POL Maintenance
No. 2 Fuel Oil	550	U/G Steel Tank	162
No. 2 Fuel Oil	1,000	U/G Steel Tank	178 Warehouse
No. 2 Fuel Oil	2,000	U/G Steel Tank	187 Administration
No. 2 Fuel Oil	1,000	U/G Steel Tank	191 Log Cabin
No. 2 Fuel Oil	4,000	U/G Steel Tank	236 Officers Club
No. 2 Fuel Oil	4,000	U/G Steel Tank	251
No. 2 Fuel Oil	275-550	U/G Steel Tank	253
No. 2 Fuel Oil	550	U/G Steel Tank	255
No. 2 Fuel Oil	1,000	U/G Steel Tank	258 Warehouse
No. 2 Fuel Oil	1,000	U/G Steel Tank	266 Warehouse
No. 2 Fuel Oil	1,000	U/G Steel Tank	275 Procurement
No. 2 Fuel Oil	20,000	U/G Steel Tank	289 Heat Plant
No. 2 Fuel Oil	1,000	U/G Steel Tank	300 Med. Storage
No. 2 Fuel Oil	3,000	U/G Steel Tank	306 Grp. Headquarters
No. 2 Fuel Oil	500	U/G Steel Tank	342
No. 2 Fuel Oil	500	U/G Steel Tank	344

TABLE D.1
PETROLEUM STORAGE FACILITIES
POPE AFB
(Continued)

Type of Material	Capacity Each Tank (gallons)	Type of Storage Facility	Location of Storage Facility
No. 2 Fuel Oil	500	U/G Steel Tank	345
No. 2 Fuel Oil	20,000	U/G Steel Tank	350 Dining Hall
No. 2 Fuel Oil	1,000	U/G Steel Tank	370 Library
No. 2 Fuel Oil	1,000	U/G Steel Tank	372 Theater
No. 2 Fuel Oil	2,000	U/G Steel Tank	373 Arts-Crafts
No. 2 Fuel Oil	2,000	U/G Steel Tank	381
No. 2 Fuel Oil	1,000	U/G Steel Tank	388 Field Training
No. 2 Fuel Oil	1,000	U/G Steel Tank	390 Auto Hobby Shop
No. 2 Fuel Oil	1,000	U/G Steel Tank	400 BX Service Station
No. 2 Fuel Oil	3,000	U/G Steel Tank	402 Gym
No. 2 Fuel Oil	2,000	U/G Steel Tank	404 Bowling Lanes
No. 2 Fuel Oil	2,000	U/G Steel Tank	450 NCO Club
No. 2 Fuel Oil	2-5,000	U/G Steel Tank	452 Motor Pool
No. 2 Fuel Oil	550	U/G Steel Tank	457 Motor Pool
No. 2 Fuel Oil	2,000	U/G Steel Tank	602 Warehouse
No. 2 Fuel Oil	1,000	U/G Steel Tank	603 CE Shops
No. 2 Fuel Oil	1,000	U/G Steel Tank	604 Warehouse
No. 2 Fuel Oil	550	U/G Steel Tank	606
No. 2 Fuel Oil	1,000	U/G Steel Tank	612 Thrift Shop
No. 2 Fuel Oil	1,000	U/G Steel Tank	614 Supply Open Storage

TABLE D.1
PETROLEUM STORAGE FACILITIES
POPE AFB
(Continued)

Type of Material	Capacity Each Tank (gallons)	Type of Storage Facility	Location of Storage Facility
No. 2 Fuel Oil	550	U/G Steel Tank	617
No. 2 Fuel Oil	4,000	U/G Steel Tank	650 Aero Med.
No. 2 Fuel Oil	1,000	U/G Steel Tank	704 Cafeteria
No. 2 Fuel Oil	4,000	U/G Steel Tank	708 HG Maintenance
No. 2 Fuel Oil	2-37,500	U/G Steel Tank	712 Heat Plant
No. 2 Fuel Oil	1,000	U/G Steel Tank	729 Life Support
No. 2 Fuel Oil	500	U/G Steel Tank	737
No. 2 Fuel Oil	550	U/G Steel Tank	739
No. 2 Fuel Oil	500	U/G Steel Tank	742
No. 2 Fuel Oil	110	U/G Steel Tank	746
No. 2 Fuel Oil	1,000	U/G Steel Tank	755 Warehouse
No. 2 Fuel Oil	2,000	U/G Steel Tank	757 Support Branch
No. 2 Fuel Oil	500	U/G Steel Tank	758
No. 2 Fuel Oil	1,000	U/G Steel Tank	759 Warehouse
No. 2 Fuel Oil	2,000	U/G Steel Tank	760
No. 2 Fuel Oil	2-1,000	U/G Steel Tank	764 3 Maps
No. 2 Fuel Oil	1,000	U/G Steel Tank	766
No. 2 Fuel Oil	280	U/G Steel Tank	770
No. 2 Fuel Oil	1,000	U/G Steel Tank	990 ALCE
No. 2 Fuel Oil	200	A/G Steel Tank	2-7502
No. 2 Fuel Oil	25,000	U/G Steel Tank	41103 Bulk Storage

TABLE D.1
PETROLEUM STORAGE FACILITIES
POPE AFB
(Continued)

Type of Material	Capacity Each Tank (gallons)	Type of Storage Facility	Location of Storage Facility
No. 2 Fuel Oil	3-25,000	U/G Steel Tank	41105 Bulk Storage
JP-4	500	U/G Steel Tank	155 Sump Tank
MOGAS	3-10,000 1-6,000	U/G Steel Tank	400 BX Service Station
MOGAS	1,000	U/G Steel Tank	459 Golf Course Maintenance
Diesel	5,000	U/G Steel Tank	615 CE Yard
MOGAS	1,000	U/G Steel Tank	615 CE Yard
MOGAS	2-10,000	U/G Steel Tank	756 Base Service Station
MOGAS	5,000	U/G Steel Tank	756 Base Service Station
Diesel	10,000	U/G Steel Tank	756 Base Service Station
JP-4	2-2,500	Portable Tankers	792 Engine Testing
JP-4	10,000	A/G Steel Tank	8050 Operating Bulk Storage
Diesel	5,000	U/G Steel Tank	Phillips Area
JP-4	2,000	U/G Steel Tank	818 Sump Tank
JP-4	2,000	U/G Steel Tank	820 Sump Tank
JP-4	2,000	U/G Steel Tank	822 Sump Tank
JP-4	6-50,000	U/G Steel Tank	12818 Hydrant Fuel Storage
JP-4	6-50,000	U/G Steel Tank	12820 Hydrant Fuel Storage

TABLE D.1
PETROLEUM STORAGE FACILITIES
POPE AFB
(Continued)

Type of Material	Capacity Each Tank (gallons)	Type of Storage Facility	Location of Storage Facility
JP-4	20,000 BBLS	A/G Steel Tank	41102 Bulk Storage
JP-4	20,000 BBLS	A/G Steel Tank	41104 Bulk Storage
MOGAS	10,000	U/G Steel Tank	41106 Bulk Storage
JP-4	10,000	U/G Steel Tank	41107 Bulk Storage
JP-4	2,000	U/G Steel Tank	41112 Sump Tank
JP-4	10,000 BBLS	A/G Steel Tank	41113 Bulk Storage
Engine Oil	280	U/G Steel Tank	390 Auto Hobby Shop
Engine Oil	550	U/G Steel Tank	390 Auto Hobby Shop
Used Motor Oil	2,000	U/G Steel Tank Station	400 BX Service
Synthetic/ Mineral/Engine/ Hydraulic Oils	2-1,000	U/G Steel Tank	454 Motor Pool
Synthetic Oil	400	Bowser	792 Engine Test
Hydraulic Fluid	200	Bowser	792 Engine Test
JP-4	10,000	U/G Steel Tank	41115 Holding Area
Synthetic Engine Oil	10,000	U/G Steel Tank	41115 Holding Area
Mineral Oil	2,000	U/G Steel Tank	41115 Holding Area
AVGAS	2-5,000	Fuel Transfer Truck	758 Fire Truck Parking
JP-4	11-5,000	Fuel Transfer Truck	758
Diesel	1,500	Fuel Transfer Truck	758
MOGAS	1,500	Fuel Transfer Truck	758

TABLE D.1
PETROLEUM STORAGE FACILITIES
POPE AFB
(Continued)

Type of Material	Capacity Each Tank (gallons)	Type of Storage Facility	Location of Storage Facility
No. 2 Fuel Oil	-	Contractor Operated Fuel Truck	-
JP-4	-	Tanker Car	Off Loading Dock
JP-4	-	Aircraft Parking Apron	Aircraft Parking Apron
JP-4	-	Aircraft Parking Apron	Aircraft Parking Apron

Source: Installation Files

TABLE D.2
OIL/WATER SEPARATORS LOCATED AT POPE AFB

Location	Principal User	Estimated O/W Separator Capacity (gallons)
150	Transportation Refueling Maintenance	4,500
150	Transportation Refueling Maintenance	300
162	Fuels Management	190
250	Transportation Fire Department Maintenance	1,440
390	Auto Hobby Shop	500
450	Motor Pool	5,000
454	Motor Pool	230
624	Base Civil Engineering	138
712	Heating Plant	124
715	Engine/Propeller Shop	550
723	AGE	100
726	Aircraft Maintenance	720
731	Maintenance Activities	60
736	Fuel Cell Repair & Nose Docks	2,500
760	OMS and Fuels Management	5,000
764	3 MAPS	2,200
792	Engine Testing	2,000
805	Operating Bulk Storage	2,000
41112	Bulk Storage	330
41115	Used Oil Holding Area	250

Source: Installation Files

TABLE D.3

PESTICIDES CURRENTLY USED AT POPE AFB

Insectides	Rodenticides	Herbicides
Dursban	MAKI	Spike 5G
FICAM W	Warfarin	Roundup
Diazinon	Calcium Cyanide A-Dust	Pramitol 25E
Mayforce		Rodeo
PZ 270 Dursban	<u>Fungicides</u>	Prograss
PZ 250 Baygon		Weed Hoe 108
Unicorn Fogging Solution	Benlate	KERB
Baygon	Acti Dione Thiram	Paraquat
Ants	Daconil 2787	Chipco Ronstar G
Pharorid		Sencor
Chlordone	<u>Algaecide</u>	
Pyrethrum		
Waspand Hornet Killer	Cutrine-Plus	
Sevin		
Deltic		
Precor 5E		
Malathion		
Chlorpyifos		
Nemacur		

Source: Pest Management Plan

APPENDIX E

MASTER LIST OF SHOPS

APPENDIX E
MASTER LIST OF SHOPS

Name	Present Location (Bldg. No.)	Handles Hazardous Materials	Generates Hazardous Wastes	Typical TSD Methods
317 Avionics Maintenance Squadron				
Doppler Shop	729	Yes	No	Consumed in Process
Nav-Aids Shop	729	Yes	No	Consumed in Process
Radio Shop	729	Yes	No	Consumed in Process
Flight Simulator	706	Yes	No	Consumed in Process
Auto Pilot Shop	729	Yes	No	Consumed in Process
Electric Shop	731	Yes	Yes	Sanitary Sewer/Fort Bragg DPDO
Instrument Shop	729	Yes	No	Consumed in Process
PMEL	739	Yes	Yes	Ft. Bragg DPDO/ Heating Plant
317 Field Maintenance Squadron				
<u>Aerospace Systems</u>				
Environmental Systems	731	Yes	No	Consumed in Process
Fuel Systems Repair	734, 735, 736	Yes	Yes	Ft. Bragg DPDO/ Heating Plant/FPTA
Pneudralics Shops	731	Yes	Yes	Ft. Bragg DPDO/ Heating Plant
AR Shop	712	Yes	Yes	Ft. Bragg/ Heating Plant
<u>Fabrication</u>				
Corrosion Control	731	Yes	Yes	Ft. Bragg DPDO
NDI/Soap Lab	731	Yes	Yes	Ft. Bragg DPDO
Machine Shop	731	Yes	No	Consumed in Process

APPENDIX E
MASTER LIST OF SHOPS
(Continued)

Name	Present Location (Bldg. No.)	Handles Hazardous Materials	Generates Hazardous Wastes	Typical TSD Methods
317 Field Maintenance Squadron (Continued)				
Structural Repair	731	Yes	No	Consumed in Process
Survival Equipment	719	Yes	No	Consumed in Process
Welding Shop	731	Yes	No	Consumed in Process
Aerospace Ground Equipment (AGE)	723	Yes	Yes	Ft. Bragg DPDO/ Heating Plant
AGE Servicing	759	Yes	Yes	Ft. Bragg DPDO/ Heating Plant
<u>Propulsion Branch</u>				
Engine Shop	715	Yes	Yes	Sanitary Sewer Ft. Bragg DPDO/ Heating Plant
Engine Dispatch	715	Yes	Yes	Sanitary Sewer Ft. Bragg DPDO/ Heating Plant
Engine Supply	715	Yes	Yes	Sanitary Sewer Ft. Bragg DPDO/ Heating Plant
GTC Section	715	Yes	Yes	Ft. Bragg Heating Plant
Propeller Shop	715	Yes	Yes	Ft. Bragg Heating Plant
Test Cell	792	Yes	Yes	Ft. Bragg DPDO/ Heating Plant, Sanitary Sewer
Wheel & Tire Shop	712	Yes	Yes	Ft. Bragg DPDO/ Heating Plant

APPENDIX E
MASTER LIST OF SHOPS
(Continued)

Name	Present Location (Bldg. No.)	Handles Hazardous Materials	Generates Hazardous Wastes	Typical TSD Methods
317 Organizational Maintenance Squadron				
Wash Rack	745	Yes	Yes	Sanitary Sewer/ Ft. Bragg/Heating Plant
Non-Powered AGE	755	Yes	Yes	Ft. Bragg DPDO/ Heating Plant
Transient Support Branch	754	Yes	Yes	FPTA
Flightline Branch	718	Yes	Yes	Ft. Bragg DPDO/ Heating Plant
Inspection Branch	722	Yes	Yes	Ft. Bragg DPDO/ Heating Plant/FPTA
3-Mobile Aerial Port Squadron				
Parachute Shop	764	Yes	No	Consumed in Process
Joint Inspection/QC	764	No	No	---
Vehicle Maintenance	766	Yes	Yes	FPTA/Sanitary Sewer
Vehicle Operations	764	Yes	Yes	FPTA/Sanitary Sewer
Operations and Training Division				
Photographic Laboratory	744	Yes	Yes	Silver Recovery/ Sanitary Sewer

APPENDIX E
MASTER LIST OF SHOPS
(Continued)

Name	Present Location (Bldg. No.)	Handles Hazardous Materials	Generates Hazardous Wastes	Typical TSD Methods
317 Civil Engineering Squadron				
Electrical	617	Yes	Yes	Sanitary Sewer
Roads/Grounds	617	Yes	Yes	Ft. Bragg DPDO/ Heating Plant
Entomology	600	Yes	No	Consumed in Process
Carpentry Shop	603	Yes	No	Consumed in Process
Plumbing Shop	603	Yes	No	Consumed in Process
Metal Fabrication	603	No	No	---
Paint Shop	606	Yes	Yes	Ft. Bragg DPDO
Fuels Maintenance	606	Yes	Yes	Off-Base Contractor
Refrigeration Shop	606	Yes	Yes	Sanitary Sewer Fort Bragg DPDO/ Heating Plant
Heating Shop	606	Yes	No	Consumed in Process
Power Production	625	Yes	Yes	Sanitary Sewer
Wash Rack	624	Yes	Yes	Sanitary Sewer
317 Transportation Squadron				
Quality Control	454	Yes	Yes	Sanitary Sewer
Vehicle Maintenance	454	Yes	Yes	Ft. Bragg DPDO/ Heating Plant, Sanitary Sewer

APPENDIX E
MASTER LIST OF SHOPS
(Continued)

Name	Present Location (Bldg. No.)	Handles Hazardous Materials	Generates Hazardous Wastes	Typical TSD Methods
317 Transportation Squadron (Continued)				
Refueling Maintenance	150	Yes	Yes	Sanitary Sewer, Ft. Bragg DPDO/ Heating Plant, FPTA
Allied Trades	454	Yes	Yes	Ft. Bragg DPDO
Fire Dept. Maintenance	250	Yes	Yes	Ft. Bragg DPDO/ Heating Plant
Packing and Crating	249	Yes	No	Consumed in Process
Base Service Station	756	Yes	No	Consumed in Process
USAF Clinic				
Clinic Laboratory/X-Ray	307	Yes	Yes	Silver Recovery/ Sanitary Sewer
X-Ray	260	Yes	Yes	Silver Recovery/ Sanitary Sewer
Dental Clinic/X-Ray	260	Yes	Yes	Ft. Bragg for reclamation
Morale Welfare Recreation Division				
Arts and Crafts	373	Yes	No	Consumed in Process
Bowling Center	404	Yes	No	Consumed in Process
Auto Hobby Shop	390	Yes	Yes	Ft. Bragg Heating Plant
Golf Course Maintenance	462	Yes	No	Consumed in Process

APPENDIX E
MASTER LIST OF SHOPS
(Continued)

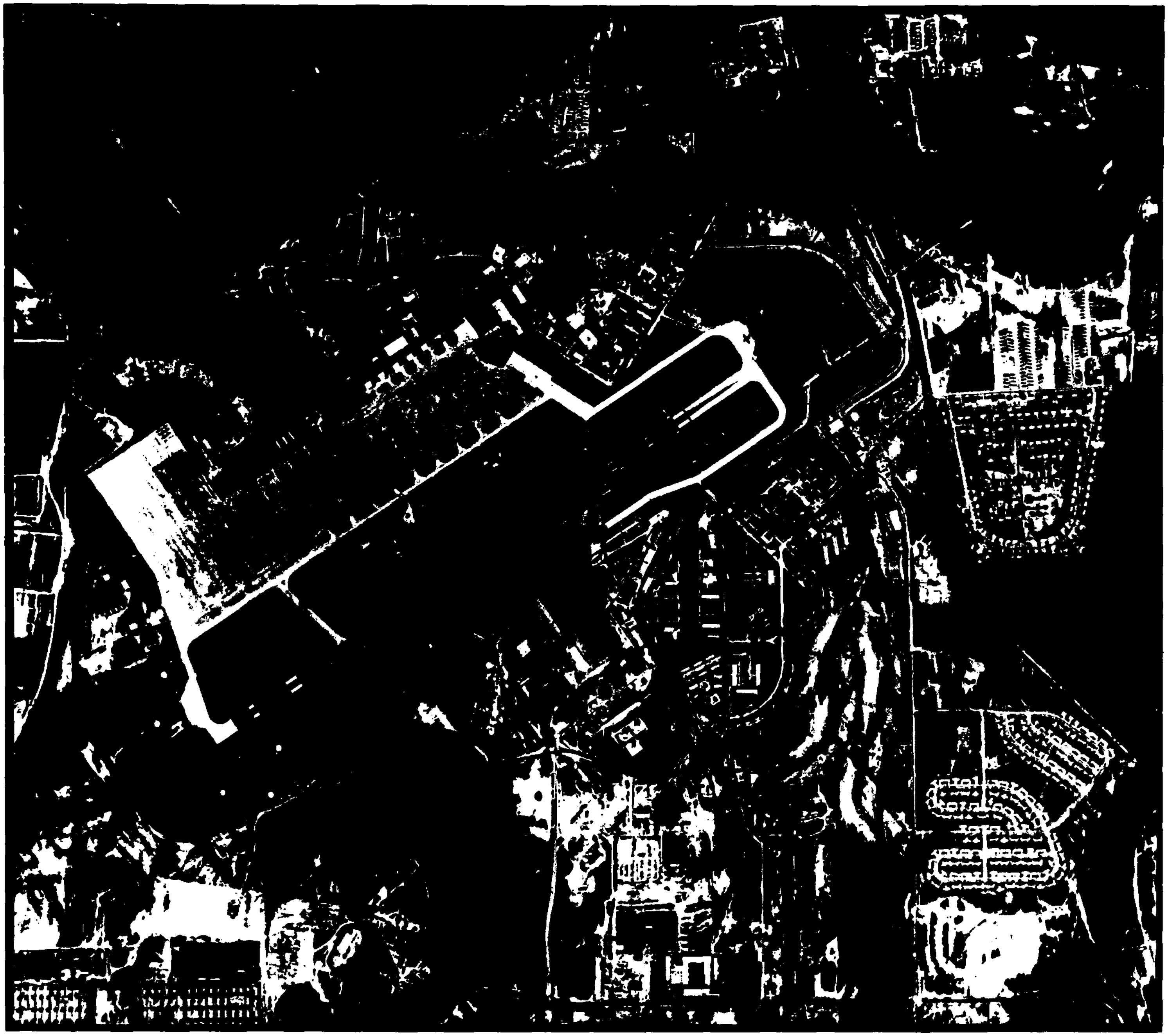
Name	Present Location (Bldg. No.)	Handles Hazardous Materials	Generates Hazardous Wastes	Typical TSD Methods
1943rd Information Systems Squadron				
DSTE Maintenance	900	Yes	No	Consumed in Process
Crypto Maintenance	900	No	No	---
Consolidated Maintenance	137	Yes	Yes	Ft. Bragg DPDO
Radar Maintenance	817	No	No	---
Weather Maintenance	817	Yes	Yes	Ft. Bragg DPDO
CCTV Maintenance	137	No	No	---
NAV-AIDS	137	No	No	---
Record Comm. Maintenance	900	Yes	No	Consumed in Process
317 Supply Squadron				
Fuels Lab	162	Yes	Yes	FPTA/Recycled, Sanitary Sewer
A Co. 82nd Aviation Branch				
	738	Yes	Yes	Ft. Bragg DPDO/ Heating Plant, Sanitary Sewer
B Co. 82nd Aviation Division				
Aircraft Maintenance	726	Yes	Yes	Ft. Bragg DPDO/ Heating Plant, Storm Sewer

APPENDIX E
MASTER LIST OF SHOPS
(Continued)

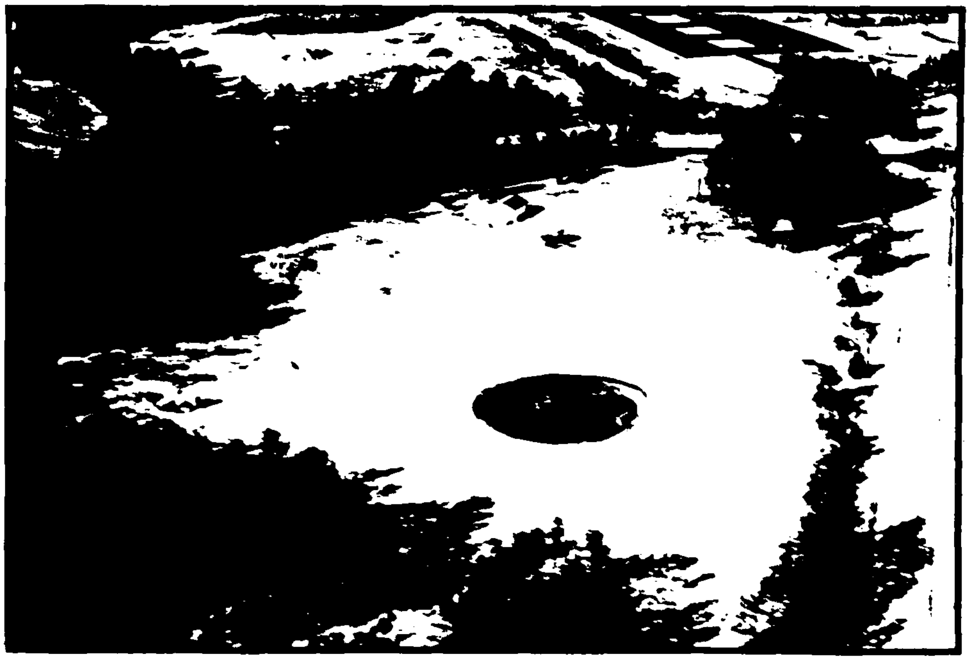
Name	Present Location (Bldg. No.)	Handles Hazardous Materials	Generates Hazardous Wastes	Typical TSD Methods
Miscellaneous				
BX Station	400	Yes	Yes	Contract Disposal Sanitary Sewer
Disaster Preparedness	2-7502	No	No	---
<u>Base Administration</u>				
Base Reprographics	306	Yes	Yes	Sanitary Sewer
Data Automation	182	Yes	No	Consumed in Process
<u>Operations</u>				
DOTL	721	Yes	No	Consumed in Process
Field Training Detachment	3831	Yes	No	Consumed in Process

APPENDIX F

PHOTOGRAPHS



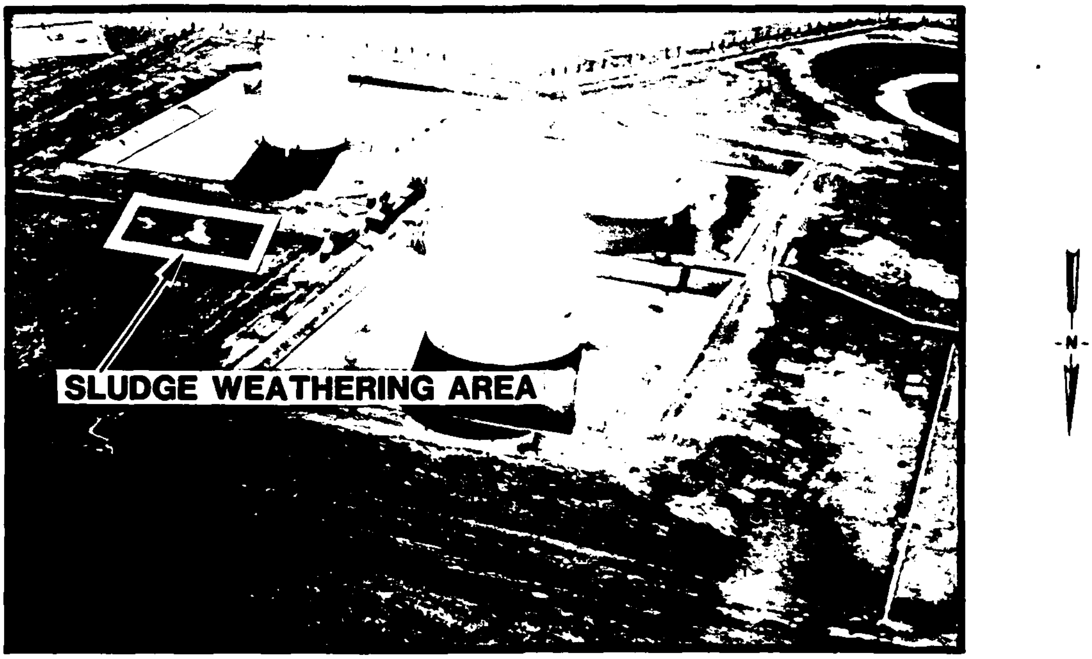
POPE AFB **November 29, 1974**



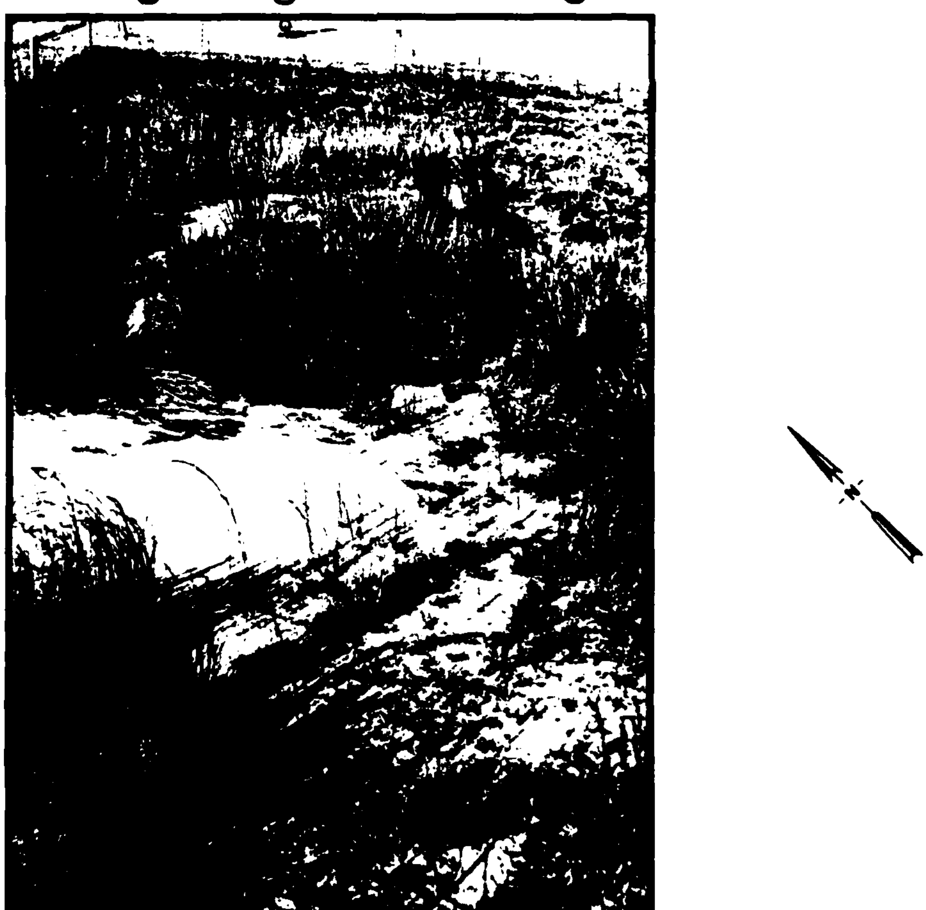
Fire Protection Training Area No. 4

Fire Protection Training Area No. 4

POPE AFB

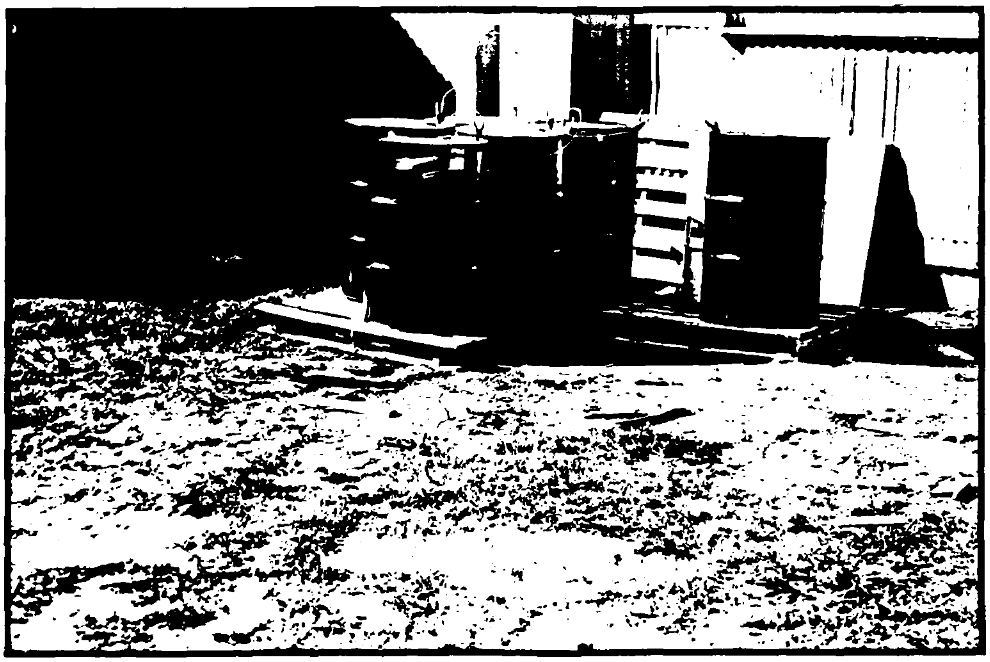


POL Bulk Storage Area and Tank Cleaning Sludge Weathering Area



POL Tank Cleaning Sludge Weathering Area

POPE AFB

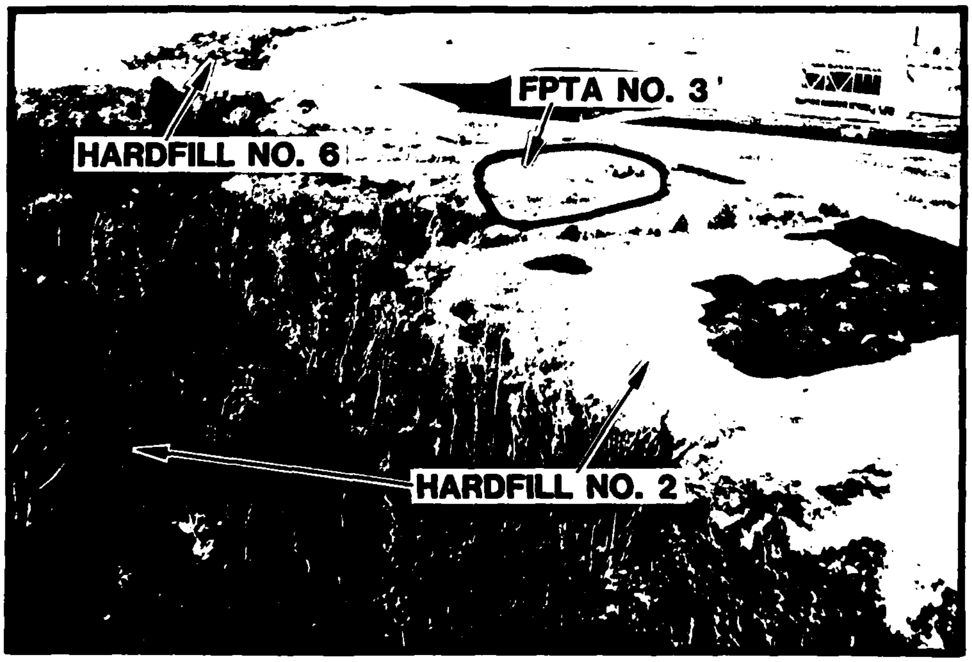


Tire Shop Waste Accumulation Area
(Facing Northwest)

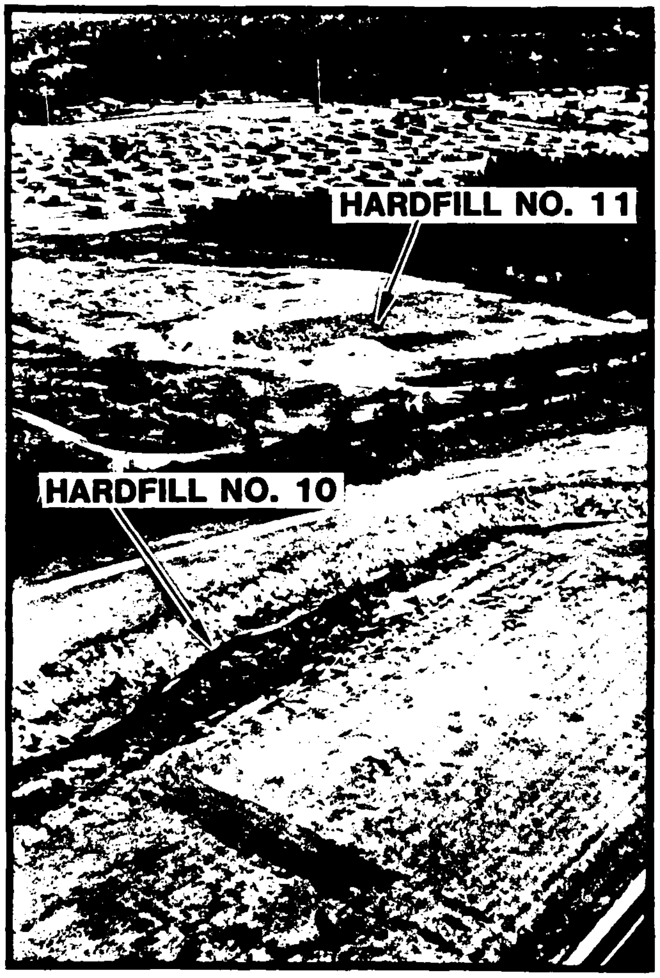
Drainage Ditch From POL Bulk Storage Area - Building 150 Area To Left
(Facing Southeast)

POPE AFB

Hardfill No. 2



POPE AFB



Hardfill No. 7

Hardfill No. 8

Hardfill No. 8

APPENDIX G

USAF INSTALLATION RESTORATION PROGRAM

HAZARD ASSESSMENT RATING METHODOLOGY

APPENDIX G

USAF INSTALLATION RESTORATION PROGRAM
HAZARD ASSESSMENT RATING METHODOLOGY

BACKGROUND

The Department of Defense (DOD) has established a comprehensive program to identify, evaluate, and control problems associated with past disposal practices at DOD facilities. One of the actions required under this program is to:

> "develop and maintain a priority listing of contaminated installations and facilities for remedial action based on potential hazard to public health, welfare, and environmental impacts." (Reference: DEQPPM 81-5, 11 December 1981).

Accordingly, the United States Air Force (USAF) has sought to establish a system to set priorities for taking further actions at sites based upon information gathered during the Records Search phase of its Installation Restoration Program (IRP).

The first site rating model was developed in June 1981 at a meeting with represenatives from USAF Occupational and Environmental Health Laboratory (OEHL), Air Force Engineering and Services Center (AFESC), Engineering-Science (ES) and CH2M Hill. The basis for this model was a system developed for EPA by JRB Associates of McLean, Virginia. The JRB model was modified to meet Air Force needs.

After using this model for 6 months at over 20 Air Force installations, certain inadequacies became apparent. Therefore, on January 26 and 27, 1982, representatives of USAF OEHL, AFESC, various major commands, Engineering-Science, and CH2M Hill met to address the inadequacies. The result of the meeting was a new site rating model designed to present a better picture of the hazards posed by sites at Air Force installations. The new rating model described in this presentation is referred to as the Hazard Assessment Rating Methodology.

PURPOSE

The purpose of the site rating model is to provide a relative ranking of sites of suspected contamination from hazardous substances. This model will assist the Air Force in setting priorities for follow-on site investigations and confirmation work under Phase II of the IRP.

This rating system is used only after it has been determined that (1) potential for contamination exists (hazardous wastes present in sufficient quantity), and (2) potential for migration exists. A site can be deleted from consideration for rating on either basis.

DESCRIPTION OF MODEL

Like the other hazardous waste site ranking models, the U.S. Air Force's site rating model uses a scoring system to rank sites for priority attention. However, in developing this model, the designers incorporated some special features to meet specific DOD program needs.

The model uses data readily obtained during the Records Search portion (Phase I) of the IRP. Scoring judgments and computations are easily made. In assessing the hazards at a given site, the model develops a score based on the most likely routes of contamination and the worst hazards at the site. Sites are given low scores only if there are clearly no hazards at the site. This approach meshes well with the policy for evaluating and setting restrictions on excess DOD properties.

As with the previous model, this model considers four aspects of the hazard posed by a specific site: the possible receptors of the contamination, the waste and its characteristics, potential pathways for waste contaminant migration, and any efforts to contain the contaminants. Each of these categories contains a number of rating factors that are used in the overall hazard rating.

The receptors category rating is calculated by scoring each factor, multiplying by a factor weighting constant and adding the weighted scores to obtain a total category score.

The pathways category rating is based on evidence of contaminant migration or an evaluation of the highest potential (worst case) for contaminant migration along one of three pathways. If evidence of contaminant migration exists, the category is given a subscore of 80 to 100 points. For indirect evidence, 80 points are assigned and for direct evidence, 100 points are assigned. If no evidence is found, the highest score among three possible routes is used. These routes are surface water migration, flooding, and ground-water migration. Evaluation of each route involves factors associated with the particular migration route. The three pathways are evaluated and the highest score among all four of the potential scores is used.

The waste characteristics category is scored in three steps. First, a point rating is assigned based on an assessment of the waste quantity and the hazard (worst case) associated with the site. The level of confidence in the information is also factored into the assessment. Next, the score is multiplied by a waste persistence factor, which acts to reduce the score if the waste is not very persistent. Finally, the score is further modified by the physical state of the waste. Liquid wastes receive the maximum score, while scores for sludges and solids are reduced.

The scores for each of the three categories are then added together and normalized to a maximum possible score of 100. Then the waste management practice category is scored. Sites at which there is no containment are not reduced in score. Scores for sites with limited containment can be reduced by 5 percent. If a site is contained and well managed, its score can be reduced by 90 percent. The final site score is calculated by applying the waste management practices category factor to the sum of the scores for the other three categories.

HAZARD ASSESSMENT RATING METHODOLOGY FLOW CHART

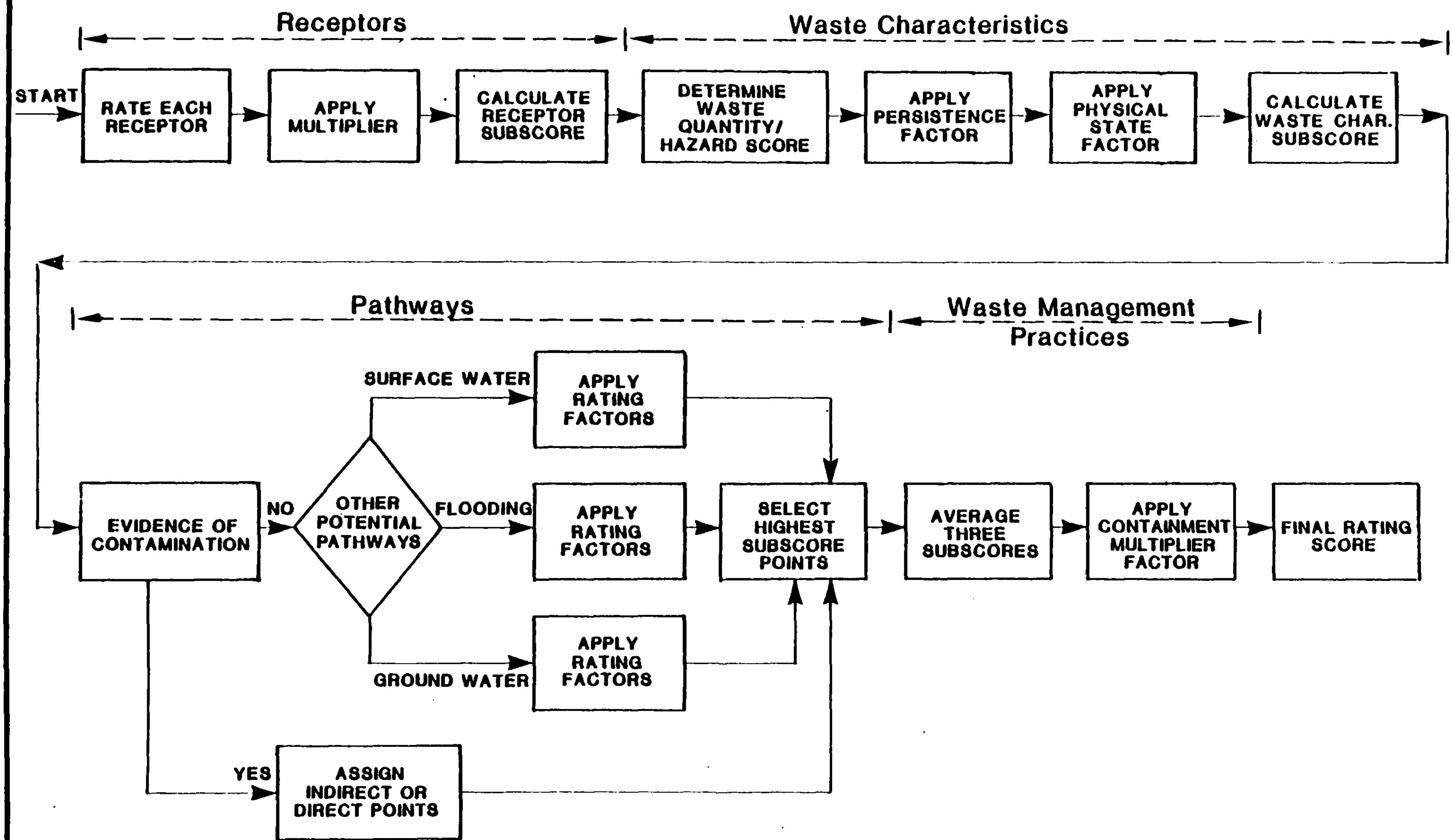


FIGURE 2

HAZARD ASSESSMENT RATING METHODOLOGY FORM

NAME OF SITE ______________________________

LOCATION ______________________________

DATE OF OPERATION OR OCCURRENCE ______________________________

OWNER/OPERATOR ______________________________

COMMENTS/DESCRIPTION ______________________________

SITE RATED BY ______________________________

I. RECEPTORS

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
A. Population within 1,000 feet of site		4		
B. Distance to nearest well		10		
C. Land use/zoning within 1 mile radius		3		
D. Distance to reservation boundary		6		
E. Critical environments within 1 mile radius of site		10		
F. Water quality of nearest surface water body		6		
G. Ground water use of uppermost aquifer		9		
H. Population served by surface water supply within 3 miles downstream of site		6		
I. Population served by ground-water supply within 3 miles of site		6		
		Subtotals	____	____

Receptors subscore (100 X factor score subtotal/maximum score subtotal) ____

II. WASTE CHARACTERISTICS

A. Select the factor score based on the estimated quantity, the degree of hazard, and the confidence level of the information.

1. Waste quantity (S = small, M = medium, L = large) ____
2. Confidence level (C = confirmed, S = suspected) ____
3. Hazard rating (H = high, M = medium, L = low) ____

Factor Subscore A (from 20 to 100 based on factor score matrix) ____

B. Apply persistence factor
Factor Subscore A X Persistence Factor = Subscore B

____ X ____ = ____

C. Apply physical state multiplier

Subscore B X Physical State Multiplier = Waste Characteristics Subscore

____ X ____ = ____

FIGURE 2 (Continued)

III. PATHWAYS

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score

A. If there is evidence of migration of hazardous contaminants, assign maximum factor subscore of 100 points for direct evidence or 80 points for indirect evidence. If direct evidence exists then proceed to C. If no evidence or indirect evidence exists, proceed to B.

Subscore ______

B. Rate the migration potential for 3 potential pathways: surface water migration, flooding, and ground-water migration. Select the highest rating, and proceed to C.

1. Surface water migration

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
Distance to nearest surface water		8		
Net precipitation		6		
Surface erosion		8		
Surface permeability		6		
Rainfall intensity		8		
		Subtotals	______	______

Subscore (100 X factor score subtotal/maximum score subtotal) ______

2. Flooding

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
Flooding		1		

Subscore (100 x factor score/3) ______

3. Ground-water migration

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
Depth to ground water		8		
Net precipitation		6		
Soil permeability		8		
Subsurface flows		8		
Direct access to ground water		8		
		Subtotals	______	______

Subscore (100 x factor score subtotal/maximum score subtotal) ______

C. Highest pathway subscore.

Enter the highest subscore value from A, B-1, B-2 or B-3 above.

Pathways Subscore ______

IV. WASTE MANAGEMENT PRACTICES

A. Average the three subscores for receptors, waste characteristics, and pathways.

Receptors ______
Waste Characteristics ______
Pathways ______

Total ______ divided by 3 = ______
Gross Total Score

B. Apply factor for waste containment from waste management practices

Gross Total Score X Waste Management Practices Factor = Final Score

______ X ______ = ______

TABLE 1

HAZARD ASSESSMENT RATING METHODOLOGY GUIDELINES

I. RECEPTORS CATEGORY

Rating Factors	Rating Scale Levels: 0	1	2	3	Multiplier
A. Population within 1,000 feet (includes on-base facilities)	0	1 - 25	26 - 100	Greater than 100	4
B. Distance to nearest water well	Greater than 3 miles	1 to 3 miles	3,001 feet to 1 mile	0 to 3,000 feet	10
C. Land Use/Zoning (within 1 mile radius)	Completely remote (zoning not applicable)	Agricultural	Commercial or industrial	Residential	3
D. Distance to installation boundary	Greater than 2 miles	1 to 2 miles	1,001 feet to 1 mile	0 to 1,000 feet	6
E. Critical environments (within 1 mile radius)	Not a critical environment	Natural areas	Pristine natural areas; minor wetlands; preserved areas; presence of economically important natural resources susceptible to contamination.	Major habitat of an endangered or threatened species; presence of recharge area; major wetlands.	10
F. Water quality/use designation of nearest surface water body	Agricultural or industrial use.	Recreation, propagation and management of fish and wildlife.	Shellfish propagation and harvesting.	Potable water supplies	6
G. Ground-Water use of uppermost aquifer	Not used, other sources readily available.	Commercial, industrial, or irrigation, very limited other water sources.	Drinking water, municipal water available.	Drinking water, no municipal water available; commercial, industrial, or irrigation, no other water source available.	9
H. Population served by surface water supplies within 3 miles downstream of site	0	1 - 50	51 - 1,000	Greater than 1,000	6
I. Population served by aquifer supplies within 3 miles of site	0	1 - 50	51 - 1,000	Greater than 1, 000	6

TABLE 1 (Continued)

HAZARD ASSESSMENT RATING METHODOLOGY GUIDELINES

II. WASTE CHARACTERISTICS

A-1 Hazardous Waste Quantity

S = Small quantity (<5 tons or 20 drums of liquid)
M = Moderate quantity (5 to 20 tons or 21 to 85 drums of liquid)
L = Large quantity (>20 tons or 85 drums of liquid)

A-2 Confidence Level of Information

C = Confirmed confidence level (minimum criteria below)

- o Verbal reports from interviewer (at least 2) or written information from the records.
- o Knowledge of types and quantities of wastes generated by shops and other areas on base.
- o Based on the above, a determination of the types and quantities of waste disposed of at the site.

S = Suspected confidence level

- o No verbal reports or conflicting verbal reports and no written information from the records.
- o Logic based on a knowledge of the types and quantities of hazardous wastes generated at the base, and a history of past waste disposal practices indicate that these wastes were disposed of at a site.

A-3 Hazard Rating

Hazard Category	Rating Scale Levels 0	1	2	3
Toxicity	Sax's Level 0	Sax's Level 1	Sax's Level 2	Sax's Level 3
Ignitability	Flash point greater than 200°F	Flash point at 140°F to 200°F	Flash point at 80°F to 140°F	Flash point less than 80°F
Radioactivity	At or below background levels	1 to 3 times background levels	3 to 5 times background levels	Over 5 times background levels

Use the highest individual rating based on toxicity, ignitability and radioactivity and determine the hazard rating.

Hazard Rating	Points
High (H)	3
Medium (M)	2
Low (L)	1

II. WASTE CHARACTERISTICS (Continued)

Waste Characteristics Matrix

Point Rating	Hazardous Waste Quantity	Confidence Level of Information	Hazard Rating
100	L	C	H
80	L	C	M
	M	C	H
70	L	S	H
60	S	C	H
	M	C	M
50	L	S	M
	L	C	L
	M	S	H
	S	C	M
40	S	S	H
	M	S	M
	M	C	L
	L	S	L
30	S	C	L
	M	S	L
	S	S	M
20	S	S	L

Notes:

For a site with more than one hazardous waste, the waste quantities may be added using the following rules:

Confidence Level

- o Confirmed confidence levels (C) can be added
- o Suspected confidence levels (S) can be added
- o Confirmed confidence levels cannot be added with suspected confidence levels

Waste Hazard Rating

- o Wastes with the same hazard rating can be added
- o Wastes with different hazard ratings can only be added in a downgrade mode, e.g., MCM + SCH = LCM if the total quantity is greater than 20 tons.

Example: Several wastes may be present at a site, each having an MCM designation (60 points). By adding the quantities of each waste, the designation may change to LCM (80 points). In this case, the correct point rating for the waste is 80.

B. Persistence Multiplier for Point Rating

Persistence Criteria	Multiply Point Rating From Part A by the Following
Metals, polycyclic compounds, and halogenated hydrocarbons	1.0
Substituted and other ring compounds	0.9
Straight chain hydrocarbons	0.8
Easily biodegradable compounds	0.4

C. Physical State Multiplier

Physical State	Multiply Point Total From Parts A and B by the Following
Liquid	1.0
Sludge	0.75
Solid	0.50

TABLE 1 (Continued)

HAZARD ASSESSMENT RATING METHODOLOGY GUIDELINES

III. PATHWAYS CATEGORY

A. Evidence of Contamination

Direct evidence is obtained from laboratory analyses of hazardous contaminants present above natural background levels in surface water, ground water, or air. Evidence should confirm that the source of contamination is the site being evaluated.

Indirect evidence might be from visual observation (i.e., leachate), vegetation stress, sludge deposits, presence of taste and odors in drinking water, or reported discharges that cannot be directly confirmed as resulting from the site, but the site is greatly suspected of being a source of contamination.

B-1 POTENTIAL FOR SURFACE WATER CONTAMINATION

Rating Factor	Rating Scale Levels 0	1	2	3	Multiplier
Distance to nearest surface water (includes drainage ditches and storm sewers)	Greater than 1 mile	2,001 feet to 1 mile	501 feet to 2,000 feet	0 to 500 feet	8
Net precipitation	Less than -10 in.	-10 to + 5 in.	+5 to +20 in.	Greater than +20 in.	6
Surface erosion	None	Slight	Moderate	Severe	8
Surface permeability	0% to 15% clay ($>10^{-2}$ cm/sec)	15% to 30% clay (10^{-2} to 10^{-4} cm/sec)	30% to 50% clay (10^{-4} to 10^{-6} cm/sec)	Greater than 50% clay ($<10^{-6}$ cm/sec)	6
Rainfall intensity based on 1 year 24-hr rainfall	<1.0 inch	1.0-2.0 inches	2.1-3.0 inches	>3.0 inches	8

B-2 POTENTIAL FOR FLOODING

Rating Factor	0	1	2	3	Multiplier
Floodplain	Beyond 100-year floodplain	In 25-year floodplain	In 10-year floodplain	Floods annually	1

B-3 POTENTIAL FOR GROUND-WATER CONTAMINATION

Rating Factor	0	1	2	3	Multiplier
Depth to ground water	Greater than 500 ft	50 to 500 feet	11 to 50 feet	0 to 10 feet	8
Net precipitation	Less than -10 in.	-10 to +5 in.	+5 to +20 in.	Greater than +20 in.	6
Soil permeability	Greater than 50% clay ($>10^{-6}$ cm/sec)	30% to 50% clay (10^{-4} to 10^{-6} cm/sec)	15% to 30% clay (10^{-2} to 10^{-4} cm/sec)	0% to 15% clay ($<10^{-2}$ cm/sec)	8
Subsurface flows	Bottom of site greater than 5 feet above high ground-water level	Bottom of site occasionally submerged	Bottom of site frequently submerged	Bottom of site located below mean ground-water level	8
Direct access to ground water (through faults, fractures, faulty well casings, subsidence fissures,	No evidence of risk	Low risk	Moderate risk	High risk	8

TABLE 1 (Continued)

HAZARD ASSESSMENT RATING METHODOLOGY GUIDELINES

IV. WASTE MANAGEMENT PRACTICES CATEGORY

A. This category adjusts the total risk as determined from the receptors, pathways, and waste characteristics categories for waste management practices and engineering controls designed to reduce this risk. The total risk is determined by first averaging the receptors, pathways, and waste characteristics subscores.

B. WASTE MANAGEMENT PRACTICES FACTOR

The following multipliers are then applied to the total risk points (from A):

Waste Management Practice	Multiplier
No containment	1.0
Limited containment	0.95
Fully contained and in full compliance	0.10

Guidelines for fully contained:

Landfills:

- o Clay cap or other impermeable cover
- o Leachate collection system
- o Liners in good condition
- o Adequate monitoring wells

Surface Impoundments:

- o Liners in good condition
- o Sound dikes and adequate freeboard
- o Adequate monitoring wells

Spills:

- o Quick spill cleanup action taken
- o Contaminated soil removed
- o Soil and/or water samples confirm total cleanup of the spill

Fire Proection Training Areas:

- o Concrete surface and berms
- o Oil/water separator for pretreatment of runoff
- o Effluent from oil/water separator to treatment plant

General Note: If data are not available or known to be complete the factor ratings under items I-A through I, III-B-1 or III-B-3, then leave blank for calculation of factor score and maximum possible score.

APPENDIX H

SITE HAZARD ASSESSMENT RATING FORMS

APPENDIX H

INDEX FOR HAZARD ASSESSMENT

METHODOLOGY FORMS

HAZARD ASSESSMENT RATING METHODOLOGY FORM

Name of site: Fire Protection Training Area No. 4
Location: South part of base;East of Aldish Rd. and building 143
Date of Operation: 1955 to Present
Owner/Operator: Pope AFB
Comments/Description: Burned fuels,waste oils,thinners,and other petroleum fluids;burial of some POL tank cleaning sludge.
Site Rated by: R.L.Thoem;J.R.Absalon;T.R.Harper

I. RECEPTORS

Rating Factor	Factor Rating (0-3)	Multi-plier	Factor Score	Maximum Possible Score
A. Population within 1,000 feet of site	2	4	8	12
B. Distance to nearest well	2	10	20	30
C. Land use/zoning within 1 mile radius	3	3	9	9
D. Distance to installation boundary	3	6	18	18
E. Critical environments within 1 mile radius of site	3	10	30	30
F. Water quality of nearest surface water body	1	6	6	18
G. Ground water use of uppermost aquifer	1	9	9	27
H. Population served by surface water supply within 3 miles downstream of site	0	6	0	18
I. Population served by ground-water supply within 3 miles of site	2	6	12	18
Subtotals			112	180

Receptors subscore (100 x factor score subtotal/maximum score subtotal) 62

II. WASTE CHARACTERISTICS

A. Select the factor score based on the estimated quantity, the degree of hazard, and the confidence level of the information.

1. Waste quantity (small, medium, or large) L = large
2. Confidence level (confirmed or suspected) C = confirmed
3. Hazard rating (low, medium, or high) H = high

Factor Subscore A (from 20 to 100 based on factor score matrix) 100

B. Apply persistence factor
Factor Subscore A x Persistence Factor = Subscore B

100 x 0.80 = 80

C. Apply physical state multiplier
Subscore B x Physical State Multiplier = Waste Characteristics Subscore

80 x 1.00 = 80

III. PATHWAYS

A. If there is evidence of migration of hazardous contaminants, assign maximum factor subscore of 100 points for direct evidence or 80 points for indirect evidence. If direct evidence exists then proceed to C. If no evidence or indirect evidence exists, proceed to B.

Subscore 80

B. Rate the migration potential for 3 potential pathways: surface water migration, flooding, and ground-water migration. Select the highest rating and proceed to C.

Rating Factor	Factor Rating (0-3)	Multi-plier	Factor Score	Maximum Possible Score
1. Surface Water Migration				
Distance to nearest surface water	2	8	16	24
Net precipitation	1	6	6	18
Surface erosion	2	8	16	24
Surface permeability	0	6	0	18
Rainfall intensity	3	8	24	24
Subtotals			62	108
Subscore (100 x factor score subtotal/maximum score subtotal)				57
2. Flooding	0	1	0	3
Subscore (100 x factor score/3)				0
3. Ground-water migration				
Depth to ground water	3	8	24	24
Net precipitation	1	6	6	18
Soil permeability	3	8	24	24
Subsurface flows	1	8	8	24
Direct access to ground water	2	8	16	24
Subtotals			78	114
Subscore (100 x factor score subtotal/maximum score subtotal)				68

C. Highest pathway subscore.

Enter the highest subscore value from A, B-1, B-2 or B-3 above.

Pathways Subscore 80

IV. WASTE MANAGEMENT PRACTICES

A. Average the three subscores for receptors, waste characteristics, and pathways.

Receptors		62	
Waste Characteristics		80	
Pathways		80	
Total	222	divided by 3 =	74 Gross total score

B. Apply factor for waste containment from waste management practices.

Gross total score x waste management practices factor = final score

74 x 1.00 = \ 74 \

FINAL SCORE

HAZARD ASSESSMENT RATING METHODOLOGY FORM

Name of site: Tire Shop Waste Accumulation Area
Location: Outside building 71? at SE corner
Date of Operation: 1975 to Present
Owner/Operator: Pope AFB
Comments/Description: Stripper leak area

Site Rated by: R.L.Thoem;J.R.Absalon;T.R.Harper

I. RECEPTORS

Rating Factor	Factor Rating (0-3)	Multi- plier	Factor Score	Maximum Possible Score
A. Population within 1,000 feet of site	3	4	12	12
B. Distance to nearest well	3	10	30	30
C. Land use/zoning within 1 mile radius	3	3	9	9
D. Distance to installation boundary	3	6	18	18
E. Critical environments within 1 mile radius of site	3	10	30	30
F. Water quality of nearest surface water body	1	6	6	18
G. Ground water use of uppermost aquifer	1	9	9	27
H. Population served by surface water supply within 3 miles downstream of site	0	6	0	18
I. Population served by ground-water supply within 3 miles of site	2	6	12	18
Subtotals			126	180

Receptors subscore (100 x factor score subtotal/maximum score subtotal) 70

II. WASTE CHARACTERISTICS

A. Select the factor score based on the estimated quantity, the degree of hazard, and the confidence level of the information.

1. Waste quantity (small, medium, or large) S = small
2. Confidence level (confirmed or suspected) C = confirmed
3. Hazard rating (low, medium, or high) H = high

Factor Subscore A (from 20 to 100 based on factor score matrix) 60

B. Apply persistence factor
Factor Subscore A x Persistence Factor = Subscore B

60 x 1.00 = 60

C. Apply physical state multiplier
Subscore B x Physical State Multiplier = Waste Characteristics Subscore

60 x 1.00 = 60

III. PATHWAYS

A. If there is evidence of migration of hazardous contaminants, assign maximum factor subscore of 100 points for direct evidence or 80 points for indirect evidence. If direct evidence exists then proceed to C. If no evidence or indirect evidence exists, proceed to B.

Subscore 80

B. Rate the migration potential for 3 potential pathways: surface water migration, flooding, and ground-water migration. Select the highest rating and proceed to C.

Rating Factor	Factor Rating (0-3)	Multi-plier	Factor Score	Maximum Possible Score
1. Surface Water Migration				
Distance to nearest surface water	2	8	16	24
Net precipitation	1	6	6	18
Surface erosion	0	8	0	24
Surface permeability	0	6	0	18
Rainfall intensity	3	8	24	24
Subtotals			46	108
Subscore (100 x factor score subtotal/maximum score subtotal)				43
2. Flooding	0	1	0	3
Subscore (100 x factor score/3)				0
3. Ground-water migration				
Depth to ground water	3	8	24	24
Net precipitation	1	6	6	18
Soil permeability	3	8	24	24
Subsurface flows	0	8	0	24
Direct access to ground water	2	8	16	24
Subtotals			70	114
Subscore (100 x factor score subtotal/maximum score subtotal)				61

C. Highest pathway subscore.

Enter the highest subscore value from A, B-1, B-2 or B-3 above.

Pathways Subscore 80

IV. WASTE MANAGEMENT PRACTICES

A. Average the three subscores for receptors, waste characteristics, and pathways.

Receptors		70	
Waste Characteristics		60	
Pathways		80	
Total	210	divided by 3 =	70 Gross total score

B. Apply factor for waste containment from waste management practices.

Gross total score x waste management practices factor = final score

70 x 1.00 = 70

FINAL SCORE

HAZARD ASSESSMENT RATING METHODOLOGY FORM

Name of site: POL Bulk Storage Area
Location: South of Gena St.; North of Hurst Dr.
Date of Operation: 1950's to Present
Owner/Operator: Pope AFB
Comments/Description: Spilled or leaked JP-4

Site Rated by: R.L.Thoem;J.R.Absalon;T.R.Harper

I. RECEPTORS

Rating Factor	Factor Rating (0-3)	Multi-plier	Factor Score	Maximum Possible Score
A. Population within 1,000 feet of site	3	4	12	12
B. Distance to nearest well	2	10	20	30
C. Land use/zoning within 1 mile radius	3	3	9	9
D. Distance to installation boundary	3	6	18	18
E. Critical environments within 1 mile radius of site	3	10	30	30
F. Water quality of nearest surface water body	1	6	6	18
G. Ground water use of uppermost aquifer	1	9	9	27
H. Population served by surface water supply within 3 miles downstream of site	0	6	0	18
I. Population served by ground-water supply within 3 miles of site	2	6	12	18
Subtotals			116	180

Receptors subscore (100 x factor score subtotal/maximum score subtotal) 64

II. WASTE CHARACTERISTICS

A. Select the factor score based on the estimated quantity, the degree of hazard, and the confidence level of the information.

1. Waste quantity (small, medium, or large) L = large
2. Confidence level (confirmed or suspected) C = confirmed
3. Hazard rating (low, medium, or high) H = high

Factor Subscore A (from 20 to 100 based on factor score matrix) 100

B. Apply persistence factor
Factor Subscore A x Persistence Factor = Subscore B

100 x 0.80 = 80

C. Apply physical state multiplier
Subscore B x Physical State Multiplier = Waste Characteristics Subscore

80 x 1.00 = 80

III. PATHWAYS

A. If there is evidence of migration of hazardous contaminants, assign maximum factor subscore of 100 points for direct evidence or 80 points for indirect evidence. If direct evidence exists then proceed to C. If no evidence or indirect evidence exists, proceed to B.

Subscore 80

B. Rate the migration potential for 3 potential pathways: surface water migration, flooding, and ground-water migration. Select the highest rating and proceed to C.

Rating Factor	Factor Rating (0-3)	Multi-plier	Factor Score	Maximum Possible Score
1. Surface Water Migration				
Distance to nearest surface water	2	8	16	24
Net precipitation	1	6	6	18
Surface erosion	1	8	8	24
Surface permeability	0	6	0	18
Rainfall intensity	3	8	24	24
Subtotals			54	108
Subscore (100 x factor score subtotal/maximum score subtotal)				50
2. Flooding	0	1	0	3
Subscore (100 x factor score/3)				0
3. Ground-water migration				
Depth to ground water	3	8	24	24
Net precipitation	1	6	6	18
Soil permeability	3	8	24	24
Subsurface flows	1	8	8	24
Direct access to ground water	2	8	16	24
Subtotals			78	114
Subscore (100 x factor score subtotal/maximum score subtotal)				68

C. Highest pathway subscore.

Enter the highest subscore value from A, B-1, B-2 or B-3 above.

Pathways Subscore 80

IV. WASTE MANAGEMENT PRACTICES

A. Average the three subscores for receptors, waste characteristics, and pathways.

Receptors		64	
Waste Characteristics		80	
Pathways		80	
Total	224	divided by 3 =	75 Gross total score

B. Apply factor for waste containment from waste management practices.

Gross total score x waste management practices factor = final score

75 x 0.95 = 71

FINAL SCORE

HAZARD ASSESSMENT RATING METHODOLOGY FORM

Name of site: POL Sludge Disposal Area
Location: East side of Bulk Storage Tanks
Date of Operation: 1950's to 1975
Owner/Operator: Pope AFB
Comments/Description: POL tank cleaning sludge disposal area

Site Rated by: R.L.Thoem;J.R.Absalon;T.R.Harper

I. RECEPTORS

Rating Factor	Factor Rating (0-3)	Multi-plier	Factor Score	Maximum Possible Score
A. Population within 1,000 feet of site	3	4	12	12
B. Distance to nearest well	2	10	20	30
C. Land use/zoning within 1 mile radius	3	3	9	9
D. Distance to installation boundary	3	6	18	18
E. Critical environments within 1 mile radius of site	3	10	30	30
F. Water quality of nearest surface water body	1	6	6	18
G. Ground water use of uppermost aquifer	1	9	9	27
H. Population served by surface water supply within 3 miles downstream of site	0	6	0	18
I. Population served by ground-water supply within 3 miles of site	2	6	12	18
Subtotals			116	180

Receptors subscore (100 x factor score subtotal/maximum score subtotal) 64

II. WASTE CHARACTERISTICS

A. Select the factor score based on the estimated quantity, the degree of hazard, and the confidence level of the information.

1. Waste quantity (small, medium, or large) S = small
2. Confidence level (confirmed or suspected) C = confirmed
3. Hazard rating (low, medium, or high) H = high

Factor Subscore A (from 20 to 100 based on factor score matrix) 60

B. Apply persistence factor
Factor Subscore A x Persistence Factor = Subscore B

60 x 0.80 = 48

C. Apply physical state multiplier
Subscore B x Physical State Multiplier = Waste Characteristics Subscore

48 x 0.75 = 36

III. PATHWAYS

A. If there is evidence of migration of hazardous contaminants, assign maximum factor subscore of 100 points for direct evidence or 80 points for indirect evidence. If direct evidence exists then proceed to C. If no evidence or indirect evidence exists, proceed to B.

Subscore 80

B. Rate the migration potential for 3 potential pathways: surface water migration, flooding, and ground-water migration. Select the highest rating and proceed to C.

Rating Factor	Factor Rating (0-3)	Multi-plier	Factor Score	Maximum Possible Score
1. Surface Water Migration				
Distance to nearest surface water	2	8	16	24
Net precipitation	1	6	6	18
Surface erosion	1	8	8	24
Surface permeability	0	6	0	18
Rainfall intensity	3	8	24	24
Subtotals			54	108
Subscore (100 x factor score subtotal/maximum score subtotal)				50
2. Flooding	0	1	0	3
Subscore (100 x factor score/3)				0
3. Ground-water migration				
Depth to ground water	3	8	24	24
Net precipitation	1	6	6	18
Soil permeability	3	8	24	24
Subsurface flows	1	8	8	24
Direct access to ground water	2	8	16	24
Subtotals			78	114
Subscore (100 x factor score subtotal/maximum score subtotal)				68

C. Highest pathway subscore.

Enter the highest subscore value from A, B-1, B-2 or B-3 above.

Pathways Subscore 80

IV. WASTE MANAGEMENT PRACTICES

A. Average the three subscores for receptors, waste characteristics, and pathways.

Receptors	64	
Waste Characteristics	36	
Pathways	80	
Total 180 divided by 3 =		60 Gross total score

B. Apply factor for waste containment from waste management practices.

Gross total score x waste management practices factor = final score

60 x 1.00 = \ 60 \

FINAL SCORE

HAZARD ASSESSMENT RATING METHODOLOGY FORM

Name of site: Hardfill No. 2
Location: South of Taxiway No. 10; North of Hurst Dr.; East of Aldish Rd.
Date of Operation: 1950's to Present
Owner/Operator: Pope AFB
Comments/Description: Some motor oil and heating fuels disposed with hardfill materials
Site Rated by: R.L.Thoem;J.R.Absalon;T.R.Harper

I. RECEPTORS

Rating Factor	Factor Rating (0-3)	Multi-plier	Factor Score	Maximum Possible Score
A. Population within 1,000 feet of site	2	4	8	12
B. Distance to nearest well	2	10	20	30
C. Land use/zoning within 1 mile radius	3	3	9	9
D. Distance to installation boundary	2	6	12	18
E. Critical environments within 1 mile radius of site	3	10	30	30
F. Water quality of nearest surface water body	1	6	6	18
G. Ground water use of uppermost aquifer	1	9	9	27
H. Population served by surface water supply within 3 miles downstream of site	0	6	0	18
I. Population served by ground-water supply within 3 miles of site	2	6	12	18
Subtotals			106	180

Receptors subscore (100 x factor score subtotal/maximum score subtotal) 59

II. WASTE CHARACTERISTICS

A. Select the factor score based on the estimated quantity, the degree of hazard, and the confidence level of the information.

1. Waste quantity (small, medium, or large) S = small
2. Confidence level (confirmed or suspected) C = confirmed
3. Hazard rating (low, medium, or high) H = high

Factor Subscore A (from 20 to 100 based on factor score matrix) 60

B. Apply persistence factor
Factor Subscore A x Persistence Factor = Subscore B

60 x 0.80 = 48

C. Apply physical state multiplier
Subscore B x Physical State Multiplier = Waste Characteristics Subscore

48 x 1.00 = 48

III. PATHWAYS

A. If there is evidence of migration of hazardous contaminants, assign maximum factor subscore of 100 points for direct evidence or 80 points for indirect evidence. If direct evidence exists then proceed to C. If no evidence or indirect evidence exists, proceed to B.

Subscore 0

B. Rate the migration potential for 3 potential pathways: surface water migration, flooding, and ground-water migration. Select the highest rating and proceed to C.

Rating Factor	Factor Rating (0-3)	Multi-plier	Factor Score	Maximum Possible Score
1. Surface Water Migration				
Distance to nearest surface water	3	8	24	24
Net precipitation	1	6	6	18
Surface erosion	2	8	16	24
Surface permeability	0	6	0	18
Rainfall intensity	3	8	24	24
Subtotals			70	108
Subscore (100 x factor score subtotal/maximum score subtotal)				65
2. Flooding	0	1	0	3
Subscore (100 x factor score/3)				0
3. Ground-water migration				
Depth to ground water	3	8	24	24
Net precipitation	1	6	6	18
Soil permeability	3	8	24	24
Subsurface flows	1	8	8	24
Direct access to ground water	2	8	16	24
Subtotals			78	114
Subscore (100 x factor score subtotal/maximum score subtotal)				68

C. Highest pathway subscore.
Enter the highest subscore value from A, B-1, B-2 or B-3 above.

Pathways Subscore 68

IV. WASTE MANAGEMENT PRACTICES

A. Average the three subscores for receptors, waste characteristics, and pathways.

Receptors		59	
Waste Characteristics		48	
Pathways		68	
Total	175	divided by 3 =	58 Gross total score

B. Apply factor for waste containment from waste management practices.
Gross total score x waste management practices factor = final score

58 x 1.00 = 58

FINAL SCORE

HAZARD ASSESSMENT RATING METHODOLOGY FORM

Name of site: Hardfill No. 8
Location: North of Hurst Dr. and building 764
Date of Operation: 1960 to present
Owner/Operator: Pope AFB
Comments/Description: Some JP-4 disposed with hardfill materials

Site Rated by: R.L.Thoem; J.R.Absalon

I. RECEPTORS

Rating Factor	Factor Rating (0-3)	Multi-plier	Factor Score	Maximum Possible Score
A. Population within 1,000 feet of site	2	4	8	12
B. Distance to nearest well	2	10	20	30
C. Land use/zoning within 1 mile radius	2	3	6	9
D. Distance to installation boundary	3	6	18	18
E. Critical environments within 1 mile radius of site	3	10	30	30
F. Water quality of nearest surface water body	1	6	6	18
G. Ground water use of uppermost aquifer	1	9	9	27
H. Population served by surface water supply within 3 miles downstream of site	0	6	0	18
I. Population served by ground-water supply within 3 miles of site	2	6	12	18
Subtotals			109	180

Receptors subscore (100 x factor score subtotal/maximum score subtotal) 61

II. WASTE CHARACTERISTICS

A. Select the factor score based on the estimated quantity, the degree of hazard, and the confidence level of the information.

1. Waste quantity (small, medium, or large) M = medium
2. Confidence level (confirmed or suspected) S = suspected
3. Hazard rating (low, medium, or high) H = high

Factor Subscore A (from 20 to 100 based on factor score matrix) 50

B. Apply persistence factor
Factor Subscore A x Persistence Factor = Subscore B

50 x 0.80 = 40

C. Apply physical state multiplier
Subscore B x Physical State Multiplier = Waste Characteristics Subscore

40 x 1.00 = 40

III. PATHWAYS

A. If there is evidence of migration of hazardous contaminants, assign maximum factor subscore of 100 points for direct evidence or 80 points for indirect evidence. If direct evidence exists then proceed to C. If no evidence or indirect evidence exists, proceed to B.

Subscore 0

B. Rate the migration potential for 3 potential pathways: surface water migration, flooding, and ground-water migration. Select the highest rating and proceed to C.

Rating Factor	Factor Rating (0-3)	Multi-plier	Factor Score	Maximum Possible Score
1. Surface Water Migration				
Distance to nearest surface water	3	8	24	24
Net precipitation	1	6	6	18
Surface erosion	1	8	8	24
Surface permeability	0	6	0	18
Rainfall intensity	3	8	24	24
Subtotals			62	108
Subscore (100 x factor score subtotal/maximum score subtotal)				57
2. Flooding	0	1	0	3
Subscore (100 x factor score/3)				0
3. Ground-water migration				
Depth to ground water	3	8	24	24
Net precipitation	1	6	6	18
Soil permeability	3	8	24	24
Subsurface flows	0	8	0	24
Direct access to ground water	2	8	16	24
Subtotals			70	114
Subscore (100 x factor score subtotal/maximum score subtotal)				61

C. Highest pathway subscore.

Enter the highest subscore value from A, B-1, B-2 or B-3 above.

Pathways Subscore 61

IV. WASTE MANAGEMENT PRACTICES

A. Average the three subscores for receptors, waste characteristics, and pathways.

Receptors		61	
Waste Characteristics		40	
Pathways		61	
Total	162	divided by 3 =	54 Gross total score

B. Apply factor for waste containment from waste management practices.

Gross total score x waste management practices factor = final score

54 x 1.00 = \ 54 \

FINAL SCORE

APPENDIX I

GLOSSARY OF TERMINOLOGY AND ABBREVIATIONS

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GLOSSARY OF TERMINOLOGY AND ABBREVIATIONS

ABG: Air Base Group.

AF: Air Force.

AFB: Air Force Base.

AFESC: Air Force Engineering and Services Center.

AFFF: Aqueous Film Forming Foam, a fire extinquishing agent. AFFF concentrates include fluorinated surfactants plus foam stabilizers diluted with water to a 3 to 6% solution.

AFR: Air Force Regulation.

Ag: Chemical symbol for silver.

AGE: Aerospace Ground Equipment.

AGS: Aircraft Generation Squadron.

Al: Chemical symbol for aluminum.

ALLUVIUM: Materials eroded, transported and deposited by streams.

AROMATIC: Description of organic chemical compounds in which the carbon atoms are arranged into a ring with special electron stability associated. Aromatic compounds are often more reactive than non-aromatics.

ARTESIAN: Ground water contained under hydrostatic pressure.

AQUICLUDE: Poorly permeable formation that impedes ground-water movement and does not yield to a well or spring.

AQUIFER: A geologic unit which impedes ground-water flow.

AQUITARD: A geologic unit which impedes ground-water flow.

ATC: Air Training Command.

AVGAS: Aviation Gasoline.

Ba: Chemical symbol for barium.

BEDROCK: Any solid rock exposed at the surface of the earth or overlain by unconsolidated material.

BEE: Bioenvironmental Engineer.

BES: Bioenvironmental Engineering Services.

BIOACCUMULATE: Tendency of elements or compounds to accumulate or build up in the tissues of living organisms when they are exposed to these elements in their environments, e.g., heavy metals.

BIODEGRADABLE: The characteristic of a substance to be broken down from complex to simple compounds by microorganisms.

BOWSER: A portable tank, usually under 200 gallons in capacity.

BX: Base Exchange.

$CaCO_3$: Chemical symbol for calcium carbonate.

Cd: Chemical symbol for cadmium.

CE: Civil Engineering.

CERCLA: Comprehensive Environmental Response, Compensation and Liability Act.

CES: Civil Engineering Squadron.

CIRCA: About; used to indicate an approximate date.

CLOSURE: The completion of a set of rigidly defined functions for a hazardous waste facility no longer in operation.

CN: Chemical symbol for cyanide.

COASTAL PLAINS: Physiographic province of the Eastern United States characterized by a gently seaward sloping surface formed over exposed, unconsolidated, stratified marine fluvial sediments. Typical coastal plain features include low hills and ridges, organic deposits, floodplains and high water tables.

COD: Chemical Oxygen Demand, a measure of the amount of oxygen required to oxidize organic and oxidizable inorganic compounds in water.

COE: Corps of Engineers.

CONFINED AQUIFER: An aquifer bounded above and below by impermeable strata or by geologic units of distinctly lower permeability than that of the aquifer itself.

CONFINING UNIT: An aquitard or other poorly permeable layer which restricts the movement of ground water.

CONTAMINATION: The degradation of natural water quality to the extent that its usefulness is impaired; there is no implication of any specific limits since the degree of permissible contamination depends upon the intended end use or uses of the water.

Cr: Chemical symbol for chromium.

CSG: Combat Support Group.

Cu: Chemical symbol for copper.

DEQPPM: Defense Environmental Quality Program Policy Memorandum

DET: Detachment.

DISPOSAL FACILITY: A facility or part of a facility at which hazardous waste is intentionally placed into or on land or water, and at which waste will remain after closure.

DISPOSAL OF HAZARDOUS WASTE: The discharge, deposit, injection, dumping, spilling, or placing of any hazardous waste into or on land or water so that such waste or any constituent thereof may enter the environment or be emitted into the air or discharged into any waters, including ground water.

DOD: Department of Defense.

DOWNGRADIENT: In the direction of decreasing hydraulic static head; the direction in which ground water flows.

DPDO: Defense Property Disposal Office, previously included Redistribution and Marketing (R&M) and Salvage.

DUMP: An uncovered land disposal site where solid and/or liquid wastes are deposited with little or no regard for pollution control or aesthetics; dumps are susceptible to open burning and are exposed to the elements, disease vectors and scavengers.

EFFLUENT: A liquid waste discharge from a manufacturing or treatment process, in its natural state, or partially or completely treated, that discharges into the environment.

ELECTRICAL RESISTIVITY (ER): Specialized equipment designed to produce an electrical current through subsurface geologic strata. The instrument and the technique permit the operator to examine conditions at specific depths below land surface. Subsurface contrasts indicative of specific geologic or hydrologic conditions may be obtained through correlation of the ER data with known site information such as that provided by test borings or well construction logs.

EMS: Equipment Maintenance Squadron.

EP: Extraction Procedure, the EPA's standard laboratory procedure for leachate generation.

EPA: U.S. Environmental Protection Agency.

EROSION: The wearing away of land surface by wind, water, or chemical processes.

ES: Engineering-Science, Inc.

FAA: Federal Aviation Administration.

FACILITY (As Applied to Hazardous Wastes): Any land and appurtenances thereon and thereto used for the treatment, storage and/or disposal of hazardous wastes.

FAULT: A fracture in rock along which the adjacent rock surfaces are differentially displaced.

Fe: Chemical symbol for iron.

FLOOD PLAIN: The lowland and relatively flat areas adjoining inland and coastal areas of the mainland and off-shore islands, including, at a minimum, areas subject to a one percent or greater chance of flooding in any given year.

FLOW PATH: The direction or movement of ground water as governed principally by the hydraulic gradient.

FMS: Field Maintenance Squadron.

FPTA: Fire Protection Training Area.

GC/MS: Gas chromatograph/mass spectrophotometer, a laboratory procedure for identifying unknown compounds.

GEOPHYSICS: (Geophysical survey) the use of one or more geophysical instruments or methods to measure specific properties of the earth's subsurface through indirect means. Geophysical equipment may include electrical resistivity, geiger counter, magnetometer, metal detector, electromagnetic conductivity, magnetic susceptibility, etc. Geophysics seeks to provide specific measurements of the earth's magnetic field, the electrical properties of specific geologic strata, radioactivity, etc.

GROUND WATER: Water beneath the land surface in the saturated zone that is under atmospheric or artesian pressure.

GROUND WATER RESERVOIR: The earth materials and the intervening open spaces that contain ground water.

HALOGEN: The class of chemical elements including fluorine, chlorine, bromine, and iodine.

HARDFILL: Disposal sites receiving construction debris, wood, miscellaneous spoil material.

HARM: Hazard Assessment Rating Methodology.

HAZARDOUS SUBSTANCE: Under CERCLA, the definition of hazardous substance includes:

1. All substances regulated under Paragraphs 311 and 307 of the Clean Water Act (except oil);

2. All substances regulated under Paragraph 3001 of the Solid Waste Disposal Act;

3. All substances regulated under Paragraph 112 of the Clean Air Act;

4. All substances which the Administrator of EPA has acted against under Paragraph 7 of the Toxic Substance Control Act;

5. Additional substances designated under Paragraph 102 of CERCLA.

HAZARDOUS WASTE: As defined in RCRA, a solid waste, or combination of solid wastes, which because of its quantity, concentration, or physical, chemical or infectious characteristics may cause or significantly contribute to an increase in mortality or an increase in serious, irreversible, or incapacitating reversible illness; or pose a substantial present or potential hazard to human health or the environment when improperly treated, stored, transported, or disposed of, or otherwise managed.

HAZARDOUS WASTE GENERATION: The act or process of producing a hazardous waste.

HEAVY METALS: Metallic elements, including the transition series, which include many elements required for plant and animal nutrition in trace concentrations but which become toxic at higher concentrations.

Hg: Chemical symbol for mercury.

HQ: Headquarters.

HWAP: Hazardous Waste Accumulation Point.

HWMF: Hazardous Waste Management Facility.

HYDROCARBONS: Organic chemical compounds composed of hydrogen and carbon atoms chemically bonded. Hydrocarbons may be straight chain, cyclic, branched chain, aromatic, or polycyclic, depending upon arrangement of carbon atoms. Halogenated hydrocarbons are hydrocarbons in which one or more hydrogen atoms has been replaced by a halogen atom.

INFILTRATION: The movement of water through the soil surface into the ground.

IRP: Installation Restoration Program.

JP-4: Jet Propulsion Fuel Number Four; contains both kerosene and gasoline fractions.

LANDFILL: A land disposal site used for disposing solid and semi-solid materials. May refer either to a sanitary landfill or dump.

LEACHATE: A solution resulting from the separation or dissolving of soluble or particulate constituents from solid waste or other man-placed medium by percolation of water.

LEACHING: The process by which soluble materials in the soil, such as nutrients, pesticide chemicals or contaminants, are washed into a lower layer of soil or are dissolved and carried away by water.

LITHOLOGY: The description of the physical character of a rock.

LOX: Liquid Oxygen.

m: Milli (10^{-3}).

MAC: Military Airlift Command.

MAGNETOMETER (MG): A device capable of measuring localized variations in the earth's magnetic field that may be due to disturbed areas such as backfilled trenches, buried objects, etc. Measurements may be obtained at points located on a grid pattern so that the data can be contoured, revealing the location, size and intensity of the suspected anomaly.

MEK: Methyl Ethyl Ketone.

METALS: See "Heavy Metals".

mgd: Million Gallons per Day.

MIBK: Methyl Isobutyl Ketone.

MICRO: u

ug/1: Micrograms per liter.

mg/l: Milligrams per liter.

MOGAS: Motor gasoline.

Mn: Chemical symbol for manganese.

MONITORING WELL: A well used to measure ground-water levels and to obtain ground-water samples for water quality analyses. As distinguished from observation wells, monitoring wells are often designed for longer term operations. They are constructed of materials for the site-specific climatic, hydrogeologic and contaminant conditions.

MSL: Mean Sea Level.

MWR: Morale Welfare and Recreation.

NCO: Non-commissioned Officer.

NCOIC: Non-commissioned Officer In-Charge.

NDI: Non-destructive Inspection.

NET PRECIPITATION: The amount of annual precipitation minus annual evaporation.

NGVD: National Geodetic Vertical Datum of 1929. A national datum system, tied to Mean Sea Level, but referenced primarily to land-based benchmarks.

Ni: Chemical symbol for nickel.

NOAA: National Oceanic and Atmospheric Administration.

NPDES: National Pollutant Discharge Elimination System.

OBSERVATION WELL: An informally designed cased well, open to a specific geologic unit or formation, designed to allow the measurement of physical ground-water properties within the zone or unit of interest. Observation wells are designed to permit the measurement of water levels and in-situ parameters such as ground-water (flow velocity and flow direction. Not to be confused with a monitoring well, a well designed to permit accurate ground-water quality monitoring. Monitoring wells are constructed of materials compatible with site-specific climatic, hydrogeologic and contaminant conditions. monitoring well installation and construction is planned to have minimal impacts on apparent ground-water quality and will often be for longer term operation compared with observation wells.

OEHL: USAF Occupational and Environmental Health Laboratory.

OIC: Officer-In-Charge.

OMS: Organizational Maintenance Squadron.

ORGANIC: Being, containing or relating to carbon compounds, especially in which hydrogen is attached to carbon.

O&G: Symbols for oil and grease.

OUT CROP: Zone or area of exposure where a geologic unit or formation occurs at or near land surface. "Outcrop area" is an important factor in hydrogeologic studies as this zone usually corresponds to the point where significant recharge occurs. When this term is used as an intransitive verb: "Where the unit crops out....."

Pb: Chemical symbol for lead.

PCB: Polychlorinated Biphenyl; liquids used as a dielectrics in electrical equipment.

PD-680: Cleaning solvent; petroleum distillate, Stoddard solvent.

PERCOLATION: Movement of moisture by gravity or hydrostatic pressure through interstices of unsaturated rock or soil.

PERMEABILITY: The relative rate of water flow through a porous medium. The USDA, Soil Conservation Service describes permeability qualitatively as follows:

very slow	<0.06	inches/hour
slow	0.06 to 0.2	inches/hour
moderately slow	0.2 to 0.6	inches/hour
moderate	0.6 to 2.0	inches/hour
moderately rapid	2.0 to 6.0	inches/hour
rapid	6.0 to 20	inches/hour
very rapid	>20	inches/hour

PERSISTENCE: As applied to chemicals, those which are very stable and remain in the environment in their original form for an extended period of time.

PESTICIDE: An agent used to destroy pests. Pesticides include such specialty groups as herbicides, fungicides, insecticides, etc.

pH: Negative logarithm of hydrogen ion concentration.

PIEDMONT: An upland subdivision of the Appalachian Highlands Physiographic Province, extending from Alabama to New York. The zone is characterized by rolling hills and residual ridges formed by dissection of peneplained irgneous and metamorphic terrain.

pico: 10^{-12}

PMEL: Precision Measurement Equipment Lab.

POL: Petroleum, Oils and Lubricants.

POLLUTANT: Any introduced gas, liquid or solid that makes a resource unfit for a specific purpose.

POLYCYCLIC COMPOUND: All compounds in which carbon atoms are arranged into two or more rings, usually aromatic in nature.

POTENTIOMETRIC SURFACE: The imaginery surface to which water in an artesian aquifer would rise in tightly screened wells penetrating it.

ppb: Parts per billion by weight.

ppm: Parts per million by weight.

PRECIPITATION: Rainfall.

QUATERNARY MATERIALS: The second period of the Cenozoic geologic era, following the Tertiary, and including the last 2-3 million years.

RCRA: Resource Conservation and Recovery Act.

RECEPTORS: The potential impact group or resource for a waste contamination source.

RECHARGE AREA: A surface area in which surface water or precipitation percolates through the unsaturated zone and eventually reaches the zone of saturation. Recharge areas may be natural or manmade.

RECHARGE: The addition of water to the ground-water system by natural or artificial processes.

RECON: Reconnaissance.

RESISTIVITY: See Electrical Resistivity

SANITARY LANDFILL: A land disposal site using an engineered method of disposing solid wastes on land in a way that minimizes environmental hazards.

SAPROLITE: A residual soil retaining the physical appearance or former structure of the parent rock.

SATURATED ZONE: That part of the earth's crust in which all voids are filled with water.

SAX'S TOXICITY: A rating method for evaluating the toxicity of chemical materials.

SCS: U.S. Department of Agriculture Soil Conservation Service.

SLUDGE: The solid residue resulting from a manufacturing or wastewater treatment process which also produces a liquid stream. The residue which accumulates in liquid fuel storage tanks.

SOLE SOURCE: As in aquifer. The only source of potable water supplies of acceptable quality available in adequate quantities for a significant population. Sole source is a legal term which permits use control of the aquifer by designated regulatory authorities.

SOLID WASTE: Any garbage, refuse, or sludge from a waste treatment plant, water supply treatment, or air pollution control facility and other discarded material, including solid, liquid, semi-solid, or contained gaseous material resulting from industrial, commercial, mining, or agricultural operations and from community activities, but does not include solid or dissolved materials in domestic sewage; solid or dissolved materials in irrigation return flows; industrial discharges which are point source subject to permits under Section 402 of the Federal Water Pollution Control Act, as amended (86 USC 880); or source, special nuclear, or by-product material as defined by the Atomic Energy Act of 1954 (68 USC 923).

SPILL: Any unplanned release or discharge of a hazardous waste onto or into the air, land, or water.

SS: Supply Squadron.

STORAGE OF HAZARDOUS WASTE: Containment, either on a temporary basis or for a longer period, in such a manner as not to constitute disposal of such hazardous waste.

STP: Sewage Treatment Plant.

TAC: Tactical Air Command.

TCE: Trichloroethylene, a solvent and suspected carcinogen.

TDS: Total Dissolved Solids.

TOC: Total Organic Carbon.

TOXICITY: The ability of a material to produce injury or disease upon exposure, ingestion, inhalation, or assimilation by a living organism.

TRANS: Transportation Squadron.

TRANSMISSIVITY: The rate at which water is transmitted through a unit width of aquifer under a unit hydraulic gradient.

TREATMENT OF HAZARDOUS WASTE: Any method, technique, or process including neutralization designed to change the physical, chemical, or biological character or composition of any hazardous waste so as to neutralize the waste or so as to render the waste nonhazardous.

TS: Transportation Squadron.

TSD: Treatment, storage or disposal sites/methods.

UPGRADIENT: In the direction of increasing hydraulic static head; the direction opposite to the prevailing flow of ground-water.

US: United States.

USAF: United States Air Force.

USAFSS: United States Air Force Security Service.

USDA: United States Department of Agriculture.

USFWS: United States Fish and Wildlife Service.

USGS: United States Geological Survey.

WATER TABLE: Surface of a body of unconfined ground water at which the pressure is equal to that of the atmosphere.

WWTP: Wastewater Treatment Plant.

Zn: Chemical symbol for zinc.

APPENDIX J

REFERENCES

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REFERENCES

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APPENDIX J

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APPENDIX K

INDEX OF REFERENCES TO SITES WITH POTENTIAL FOR ENVIRONMENTAL CONTAMINATION AT POPE AFB

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INDEX OF REFERENCES TO SITES WITH POTENTIAL

FOR ENVIRONMENTAL CONTAMINATION

AT POPE AFB

Site	References (Page Number)
Fire Protection Training Area No. 4	3, 5, 7, 4-16, 4-22, 4-32, 4-34 5-1, 5-2, 6-2, 6-3, 6-10
POL Bulk Storage Area	3, 5, 7, 4-14, 4-17, 4-32, 4-34, 5-2, 5-3, 6-2, 6-3, 6-10
Tire Shop Waste Accumulation Area	3, 5, 7, 4-17, 4-32, 4-34, 5-2, 5-3, 6-3, 6-7, 6-10
POL Sludge Disposal Area	3, 5, 8, 4-16, 4-32, 4-34, 5-2, 5-3, 6-4, 6-7, 6-10
Hardfill No. 2	3, 5, 8, 4-27, 4-32, 4-34, 5-2, 5-3, 6-4, 6-7, 6-10
Hardfill No. 8	3, 5, 8, 4-28, 4-32, 4-34, 5-2, 5-4, 6-4, 6-9, 6-10